1998-99 State of Kentucky's Environment

Charting a Path of Progress into the Next Century

Prepared by:
The Kentucky Environmental Quality Commission

Commonwealth of Kentucky
Paul E. Patton, Governor

The Kentucky Environmental Quality Commission (EQC)
is a seven-member citizen board created under state law with a mission to:

- facilitate public discussion and resolution of environmental issues,
- monitor and report on environmental trends and conditions,
- promote partnerships to improve and protect the environment for future generations, and
- serve as an advisory board to state officials on environmental matters.

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May 1999

Published by:
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1998-99 State of Kentucky's Environment: Foreword from EQC

Paul E. Patton
Governor

Environmental Quality Commission
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Dear Fellow Kentuckians,

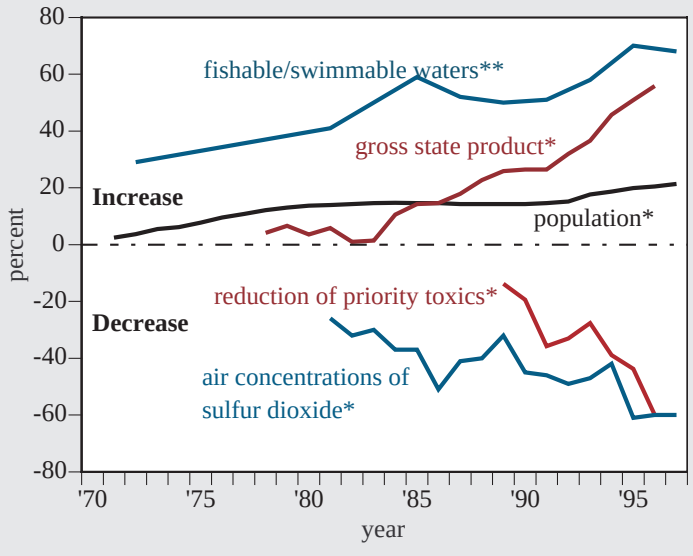
We are truly blessed to live in such a beautiful state. Not only does Kentucky boast of the most miles of waterways second to Alaska, but our landscape offers a rich diversity of life—from wildflowers to waterfowl. But pollution has taken its toll on our land, air, and water. The good news is that citizens across the state are breathing cleaner air, drinking safer water, and enjoying a cleaner environment than was the case 25 or even 10 years ago, all while our population has increased and our economy has expanded.

The *1998-99 State of Kentucky's Environment* reveals that private and public sector investments have paid off in a cleaner and safer environment. But we still have a long way to go. Many challenges lie ahead—from reducing toxic air pollutants to promoting proper garbage disposal. Addressing these and other pressing issues will have a profound influence on the quality of the environment we leave to our children and grandchildren.

On behalf of EQC, I am pleased to present the *1998-99 State of Kentucky's Environment*. The accomplishments chronicled in this report could not have been possible without the dedication of the 1,550 employees of the Natural Resources and Environmental Protection Cabinet who work each day to preserve Kentucky's environment. The Commission would like to express our gratitude for a job well done and dedicate this report to them.

Chair, Environmental Quality Commission

Charting a Path of Environmental and Economic Progress in Kentucky



*Note: Gross State Product is an important indicator of economic activity. It is a measure of total production and consumption of goods and services in Ky. *Percent change from base year (Gross state product adjusted for inflation for 1992). **Percent of monitored waterways meeting designated uses. Source: U.S. Dept. of Commerce; U.S. Census; Toxic Release Inventory; KY Div. for Air Quality; Ky. Div. of Water.*

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Acknowledgments

The Environmental Quality Commission (EQC) was mandated by the Legislature in 1990 to assess environmental conditions and report these findings every two years. EQC published its first environmental trends report in 1992 with updates in 1994 and 1996. The *1998-99 State of Kentucky's Environment: Charting a Path of Progress into the Next Century* focuses on five areas: drinking water, water quality, air quality, waste management, and toxics. Each chapter includes indicators, charts, and graphs containing data and information to measure trends and conditions, and a general discussion of findings. Data in some charts have been refined and may differ from previous reports.

The Environmental Quality Commission was mandated in 1990 to assess environmental conditions and report these findings every two years.

The report could not have been possible without the assistance of many who provided information, reviewed drafts, and offered expertise. The Commission is especially grateful to the Kentucky Department of Environmental Protection including the Division of Water, the Division for Air Quality, the Division of Waste Management, and the Risk Assessment Branch. EQC would also like to thank the Kentucky Department of Agriculture, Kentucky Agricultural Statistics Service, Kentucky Department for Public Health, Jefferson County Air Pollution Control District, Kentucky Department for Local Government, Kentucky Poison Control Center, the U.S. Environmental Protection Agency, and the Illinois State Water Survey for providing information used in the report. EQC is also grateful to Maleva Chamberlain for her assistance with editing the report.

In addition, EQC extends its appreciation to members of the *State of Kentucky's Environment* Advisory Committee for providing valuable review of the report. Members are: Jim See, American Electric Power; Caryl Pfeiffer, Kentucky Utilities; Jonathan Miller and Carl Hilton, DuPont-DOW; Allen Vicory, ORSANCO; Gordon Garner, Louisville/Jefferson County Metropolitan Sewer District; Pat Dugger, Lexington/Fayette County Department of Environmental and Emergency Management; Ronnie Pryor and Rebeckah Freeman, Kentucky Farm Bureau; Russ Barnett, University of Louisville; Judy Petersen, Kentucky Waterways Alliance; John Brazel, Kentucky Chamber of Commerce; Bill Caylor, Kentucky Coal Association; Jack Baker, Republic Services, Inc.; Midge Shelby, LWD; Cam Metcalf, Kentucky Pollution Prevention Ctr.; Carolyn Embry, American Lung Association; Mary Shinkle, Solid Waste Coordinator Assn.; Kim Menke, Toyota; Dr. Jan Stevenson, University of Louisville; Dr. Geoffrey Cobourn, Speed Scientific School; Steve Hubbs, Louisville Water Company; and State Representative Rocky Adkins.

The report includes many photographs which help to put into perspective how unique our natural environment is and the consequences of neglect. Children are pictured throughout the report to serve as a reminder that our actions today will shape the environment we leave to future generations of Kentuckians. EQC is grateful to all who donated pictures for this report and would like to acknowledge Frances Kirchhoff who donated many of the scenic pictures displayed throughout the report.

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A majority of the charts in this report were prepared by EQC using data provided by state agencies and other sources. The intent of this report is to provide a factual accounting of environmental conditions based on sound data. EQC acknowledges, however, that in some cases data may be incomplete, not collected consistently from year-to-year, or based on samples or models. Therefore, EQC notes that while measuring environmental trends and conditions is an imperfect science, it is still a valuable tool from which to chart environmental progress in Kentucky.

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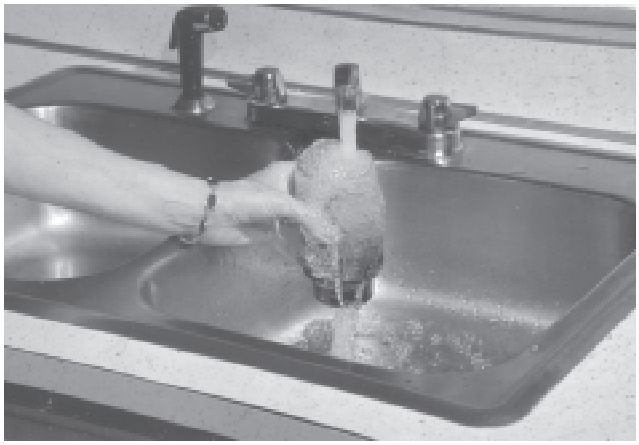
EQC welcomes comments and corrections in order to refine information for future publications. Any findings or conclusions in this report are those of EQC and do not necessarily reflect the views of the individuals or agencies mentioned above.

OVERVIEW

1998-99 State of Kentucky's Environment: Overview and Key Findings

As Kentucky enters the 21st century, the state can look back on many environmental accomplishments. Our air is safer to breathe, many waterways are cleaner, and we have made great strides in reducing toxic chemical risks—all while our economy has grown and prospered. But the state still has a long way to go to restore environmental integrity and enhance the quality of life for all Kentuckians.

The next millennium provides us with a unique opportunity to reflect on just how far Kentucky has come in protecting our environment. The *1998-99 State of Kentucky's Environment: Charting a Path of Progress into the Next Century* continues the efforts of the Environmental Quality Commission over the past six years to chart environmental improvements as well as assess the many problems that still confront the Commonwealth. Indicators in this report track the state's progress in safeguarding our drinking water supplies, protecting water and air quality, promoting proper waste management, and reducing toxic risks.



"We need water real bad. We're not asking for an arm and a leg, just good clean water."

Jerry Stacy, father of four
speaking about well pollution problems in Rowdy, Ky.
The Courier-Journal, August 16, 1998

Safe Drinking Water

Generally speaking, drinking water supplied by the 730 water systems to three million Kentuckians is safe for consumption. But recent contamination incidents, detailed in the following newspaper headlines, point to how vulnerable our public and private drinking water supplies are:

- *3 small Perry communities just want "good clean water"* (Herald-Leader, 8/16/98).
- *City's water supply tainted by nematodes* (State Journal, 9/10/98).
- *Water troubles close schools, businesses* (Courier-Journal, 9/26/98).

Public fears about the quality of public drinking water supplies have led many to question the safety of their tap water. A recent USA TODAY/CNN/Gallup poll found 47% of respondents won't drink tap water.

And some of these concerns may be well founded. A soon-to-be-released report by the U.S. Environmental Protection Agency estimates that 230,000 people get sick each year from drinking contaminated drinking water, and 50 people die as a result.

Drinking Water at a Glance (1997)

Kentuckians served by public water systems: 3,075,623
Households served by public water systems: 82%
Number of public drinking water systems: 730
Violations of drinking water regulations: 687
public systems with violations: 231 (33%)
percent of violations occurring at small systems: 87%
most common violation: monitoring/reporting (48%)
systems with violations of MCL standards: 32 (4%)*
systems in significant noncompliance: 13
Drinking water systems assessed fines: 10 ($16,950)
Boil water notices and advisories issued: 236
Kentuckians dependent on private water: 700,000
*Private water wells with potential contamination**:
58% of 2,217 wells voluntarily tested
Drinking water infrastructure needs: $2.22 billion
*Per capita state expenditures on drinking water***: 67¢*

**Maximum Contaminant Levels set to protect public health.*
*** Wells that tested positive for total fecal coliform.*
****Based on Ky. Div. of Water expenditures FY 1997-98.*

A Centers for Disease Control and Prevention study, however, suggests illnesses are closer to one million with 900 deaths a year. Getting accurate measures of illnesses caused by bad drinking water is difficult since most of the common symptoms of waterborne illness, such as nausea and diarrhea, usually get blamed on the stomach flu or contaminated food.

Public Drinking Water Quality. So how safe is Kentucky's drinking water? Trends reveal that violations of drinking water standards are declining. Five large public drinking water systems had few violations of Safe Drinking Water Act regulations during the past five years. These five systems serve an estimated 38% of the state's population. But if you get your water from a small system, there may be cause for concern. The vast majority of violations of Safe Drinking Water regulations occur at smaller plants. Data reveal that 189 systems, each serving 3,000 people or fewer, accounted for 90% of the drinking water violations cited in Kentucky during 1997. More than 38,000 people were at risk that year from systems with persistent violations of Safe Drinking Water Act rules.

While drinking water violations are declining, the number of boil water advisories has increased dramatically during the past ten years. For example, in 1987 eleven boil water advisories were issued compared to 227 in 1997, a record number in the state. The rise is attributed to system operators doing a better job monitoring water quality and responding to potential contamination due to water line breaks.

Private Drinking Water Quality. Kentuckians who rely on private water sources are at far greater risk from drinking contaminated water. An estimated 700,000 Kentuckians depend on wells, cisterns, and other private sources for drinking water.

Private supplies of water are not required to be tested, so assessing quality is difficult. However, water wells tested upon request by local health departments reveal that of the 2,217 private water wells sampled in 1997, 58% tested positive for total fecal coliform—an indicator that the water may be polluted by disease-causing bacteria. This does not necessarily mean that the groundwater source is contaminated but may be the result of poorly constructed or maintained wells.

Challenges Ahead. Governor Patton created the Water Resource Development Commission to ensure that every Kentuckian has access to potable water by the year 2020. Meeting this goal will require a significant investment in both treatment plants and distribution systems. A new state drinking water revolving loan fund capitalized with an initial federal grant of $12.5 million should help but will fall well short of the $2.2 billion needed to adequately treat public drinking water. Ensuring the proper construction and maintenance of water wells, upon which many rural Kentuckians depend for drinking will also remain an ongoing need in the state.

Improving compliance of small water plants as well as implementing the 1996 Safe Drinking Water Act Amendments are among the challenges facing the state. New federal and state rules will focus on reducing health risks associated with microbiological contaminants (Cryptosporidium and Giardia), disinfection by-products, and pesticides in drinking water.

Protecting drinking water sources from pollution is also mandated under the act's amendments. Kentucky was the first state in the nation to win approval by the U.S. EPA in 1998 for its Source Water Assessment and Protection Program. Under the program, each water supplier will be required to assess the vulnerability of its drinking water source to contamination and also plan for long-term water supply needs.

Protecting Water Supplies: One Kentucky Community's Effort

The city of Georgetown is among several communities in Kentucky working to protect their drinking water supplies.

The Georgetown Municipal Water and Sewer Service provides drinking water to 20,000 customers, 80% of which is supplied by Royal Springs. The spring is one of the largest in the region with a recharge area of about 25 square miles, of which 80% is located in Fayette County.

Officials in Georgetown have worked together with Fayette and Scott county officials to identify and map potential contaminant sources in the spring's recharge area and develop emergency spill response procedures. The final phase of the wellhead protection plan is underway and includes regulatory and nonregulatory measures to protect the aquifer.

Some 445 communities and more than half a million Kentuckians depend on groundwater for public drinking water supplies. Currently, 30 systems are in the process of developing wellhead protection plans to protect this important resource.

" It's time that we as a state face the facts that water provides life, health and jobs and that, without a supply of clean water, we have communities that are unhealthy — both environmentally and economically."

James E. Bickford, Secretary
Natural Resources and Environmental Protection Cabinet
Herald-Leader Readers' Views, April 28, 1998

Restoring Waterways

Over the past 25 years Kentucky has seen significant improvements in restoring water quality. But trends reveal nearly one-third of the 6,363 miles of waterways monitored by the state during 1997 were still impaired by pollution. And one out of four public lakes cannot be fully used for swimming, fishing, or as a drinking water source due to pollution.

Water Quality of Rivers and Streams. Kentuckians enjoy the benefits of an estimated 89,461 miles of rivers and streams. A review of the water quality in the state's 13 river basins reveals a number of waterways remain impacted by pollution. For example, the 664-mile stretch of the Ohio River bordering Kentucky, while cleaner than it was a decade ago, still can only partially meet its fishable and swimmable goals. Some of the most polluted waterways include the North Fork of the Kentucky River, the Upper Cumberland River, and the Licking River where swimming advisories have been issued over the past several years due to human health risks associated with bacteria in the water. The state has also declared urban waterways off limits to swimming, especially after heavy rainfalls, due to bacteria in the water.

Agriculture, mining, and sewage treatment plants remain the greatest sources of water pollution in the Commonwealth. Disease-carrying bacteria, often associated with untreated or poorly treated animal and human waste, are the most common pollutants detected in monitored waterways.

Water Quality of Lakes. Kentucky's lakes provide recreational benefits and also serve as a source of drinking water for seven communities Trends reveal a general improvement in the number of lakes impacted by pollution. Currently, one in four public lakes assessed cannot meet its designated uses for swimming, fishing or as a drinking water source. Agriculture remains the leading source of lake pollution, impacting one-third of the 33 impaired public lakes.

Fish Consumption/Fish Kills. Pollution also impacts aquatic life by destroying habitat and contaminating fish. Consumption of contaminated fish poses a particular risk to children and women of childbearing age, as well as to those who fish for food or sport. Six fish consumption advisories remain in effect in Kentucky. PCBs, a probable human carcinogen banned from use in 1977, is the contaminant of concern in five of the six advisories.

Trends also show a decline in fish kill incidents reported in the state. During 1997, 16 incidents killed 16,000 fish along 17.5 miles of streams.

Groundwater Quality. Groundwater supplies an estimated 1.7 million Kentuckians with drinking water. Efforts are underway to determine the quality of groundwater in Kentucky. Preliminary analysis of data from the state's groundwater monitoring network reveals varying levels of pesticides and other pollutants in water wells and springs.

Wastewater Treatment. An estimated 56% of the state's households have their sewage piped to wastewater treatment plants. These plants have prevented

Water Quality at a Glance (1997)

Miles of waterways : 89,461
miles monitored : 6,363
percent of monitored waterways polluted: 32%
Sources of pollution in monitored waterways:
agriculture: 20% coal mines: 19%*
sewage treatment plants: 17%
land disposal/septic tanks: 12% other: 32%
Waterways with fish consumption advisories: 851 miles
Public lakes assessed for pollution: 122
public lakes with pollution problems: 33
Number of wastewater treatment plants: 3,089
percent with one or more violations: 66%
Percent of households on septic systems: 44%
On-site septic system permits issued (FY 97-98): 17,285
Homes built each year with straight pipes or inadequate septic systems: 5,000 (estimate)
*Per capita state expenditures on Clean Water**: $3.13*
**Active, inactive, and abandoned coal mine sites combined.*
***Based on Ky. Div. of Water expenditures FY 1997-98.*

millions of tons of raw sewage from entering waterways. However, poor operation of wastewater plants, primarily small package plants, contribute to water quality problems throughout the Commonwealth. During 1997, 2,048 (66%) of the 3,089 wastewater treatment plants had one or more violations of water regulations. While most of the 45,373 violations were monitoring or reporting infractions, 30% of the violations were for exceeding permit limits set to protect public health and the environment.

Millions of dollars of federal, state, local and private funds have been invested to improve sewage treatment. But Kentucky still needs $3.2 billion over the next 20 years to meet municipal wastewater treatment needs, according to the 1996 Division of Water needs survey. And it is estimated that tens of millions of dollars are needed to address sewer overflows, which are common in most cities.

On-site Sewage Disposal. Many Kentucky households rely on on-site disposal systems to treat sewage. The Kentucky Department for Public Health issued 17,285 on-site septic system permits in Fiscal Year 1997-98. But the agency estimates that one in four new homes is illegally discharging sewage into waterways or has an inadequate septic system. A 1998 state law requiring an approved on-site sewage disposal plan prior to electric hookup for any new residence should help curb this problem.

Challenges Ahead. While Kentucky has made progress in restoring water quality, critical threats remain including polluted runoff from farmlands, mine sites, and urban areas; sewage from straight pipes, failing septic systems, wastewater treatment plants, and sewer overflows; and emerging issues associated with animal feeding operations. Addressing these concerns will require state, regional, and local solutions including targeted enforcement strategies as well as expanded technical and financial assistance programs

Appropriate legislation, administrative regulations, and policies are also needed to promote the regionalization of wastewater and water supply infrastructure in order to expand and improve services. The formation of county or regional water and sewer districts is envisioned as the most effective means of accomplishing the goal of regionalization.

Developing and implementing water quality plans to control pollution from agricultural operations will remain a top state priority. Each farm and logging operation must prepare a plan by October 2001. The Kentucky Division of Conservation reports that 970 plans in 64 counties have been prepared to date.

Assessing the cumulative pollution impacts to waterways will also be the focus of the Kentucky Division of Water's *Watershed Initiative*. During the next several years, watersheds will be studied, and stakeholders will be involved in efforts to protect waterways.

Restoring a Waterway: The North Fork of the Kentucky River

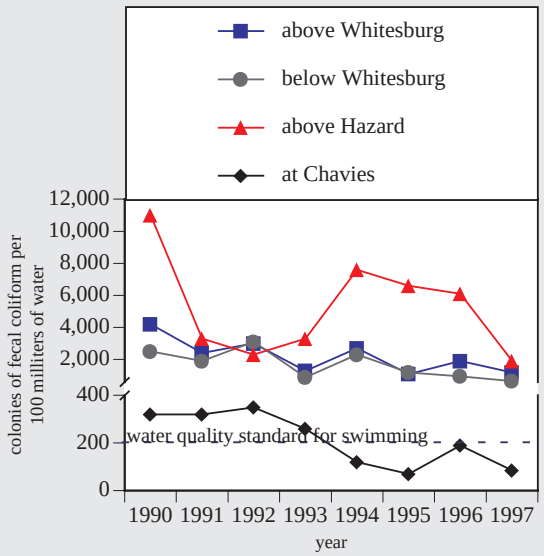
The North Fork of the Kentucky River is one of the most polluted waterways in Kentucky. But efforts are underway to clean up the watershed.

Failing wastewater treatment plants and illegal sewage discharges made the entire 163-mile length of the North Fork unsafe for swimming. A state enforcement strategy to bring wastewater treatment plants into compliance reduced the swimming advisories to 80 miles since 1993. Monitoring results from 1990 through 1997 show a decrease in fecal coliform pollution throughout the watershed.

But much more is needed to meet health-based water quality standards in the watershed. Failing septic tanks and straight pipe sewage discharges have proved to be a more difficult problem. Straight pipes have been illegal for decades, but local and state officials have been reluctant to prosecute offenders. A low-interest loan fund was recently established to help homeowners install approved septic systems in a 40-county area along the Kentucky River in hopes of tackling this tough problem.

A watershed initiative is also underway to focus local and state attention on water pollution problems in the Kentucky River watershed.

Bacteria Levels in the North Fork of the Kentucky River



Note: Water quality standard for full body contact is 200 fecal coliform colonies per 100 milliliters of water based on five samples collected within a 30 day period and calculated as geometric mean. Source: Ky. Division of Water

" At the local level, where the air meets our lungs, progress has continued consistently for several years. . . While we have made solid progress we must continue to improve air quality for the benefit of the health of our citizens and our economy."

Adrian P. Freund, Director
Jefferson Co. Dept. of Planning and Environmental Mgmt.
The Courier-Journal, September 3, 1998

Clean Air

Nowhere have environmental improvements been so dramatic as in the area of air quality. Years of pollution controls on automobiles and at industrial plants have paid off in cleaner air across the Commonwealth. Since 1980, emissions have been reduced and improvements in air quality have been achieved. Despite that progress, much remains to be accomplished. For example, some 771,875 Kentuckians live in areas having air quality that, while significantly improved, still does not meet health-based ozone standards. Additionally, millions of pounds of toxic chemicals are released each year into the air, according to the Toxics Release Inventory.

Criteria Pollutants. Since 1980, Kentucky has witnessed declining concentrations of six criteria air pollutants —lead, nitrogen dioxide, sulfur dioxide, carbon monoxide, particulate matter and ground-level ozone. Some of these improvements have been more dramatic than others. For example, carbon monoxide air concentrations dropped by 51% between 1980 and 1997 while ground-level ozone air levels declined by 21%.

Improvement in air quality is paralleled in part by reductions of the emissions of pollutants from industrial sources. Between 1980 and 1997 statewide industrial emissions of sulfur dioxide, nitrogen oxide, carbon monoxide and volatile organic compounds (excluding Jefferson County due to unavailability of data prior to 1990) dropped by 35%. Kentucky currently meets the National Ambient Air Quality Standards (NAAQS) for all of the criteria pollutants, with the exception of ground-level ozone.

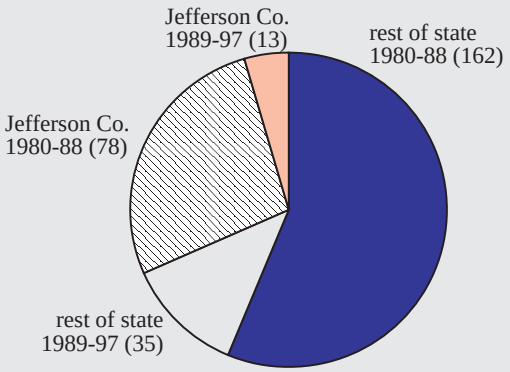
Ground-Level Ozone. Kentucky has witnessed major improvements in reducing public exposure to ground-level ozone. For example, in Louisville there were 91 exceedances of the 0.12 parts per million (ppm) one-hour ozone standard from 1980 through 1997; 78 of those exceedances occurred prior to 1989 and only 13 in the past nine years. In the rest of Kentucky, there were 162 exceedances of the ozone standard between 1980 and 1988, 35 were recorded during the past nine years.

Improvements in reducing public exposure to ozone are not achieved directly since this pollutant is not actually emitted in significant amounts. Rather ground-level ozone is formed through reactions of nitrogen oxides (a by-product of energy combustion) and volatile organic compounds (from evaporating solvents, inks, coatings, fuels) in the presence of sunlight. The health effects from exposure to ozone

Air Quality at a Glance (1997)

Number of days with one or more ozone pollution exceedance (statewide): 5
Counties not meeting one-hour 0.12 ppm ozone standard: 3
Regulated sources of air pollution: 2,668
major sources (emitting 100 tons or more/yr.): 290
Sulfur dioxide emissions
mobile: 31,723 tons area*: 57,201 tons*
*regulated point source**: 656,900 tons*
Nitrogen oxide emissions
mobile: 217,213 tons area*: 74,728 tons*
*regulated point sources**: 398,800 tons*
Carbon monoxide emissions
mobile: 1,143,730 tons area*: 160,227 tons*
*regulated point sources**: 78,100 tons*
Volatile organic compounds emissions
mobile: 131,155 tons area*: 147,697 tons*
*regulated point sources**: 67,900 tons*
Airborne particulates (PM-10) emissions
mobile: 139,605 tons area*: 164,577*
*regulated point sources**: 26,000 tons****
Air quality violations cited: 997
Public complaints: 2,275
*complaint types***: odor - 39%; burning - 38%; dust - 22%; other - 11%*
*Per capita state expenditures on air quality*****: $2.56*
**U.S. EPA data.*
***Div. for Air Quality, Jeff. Co. Air Poll. Control Dist. data.*
****Excludes Jefferson County, data not available.*
*****Based on Ky. Div. Air Quality expenditures FY 1997-98.*

Exceedances of Ozone Standard*



**One-hour 0.12 ppm standard. Source: Ky. Div. Air Quality*

can be serious, causing reduced lung function, exacerbation of asthma, and other respiratory diseases. An estimated 20% of the state's population live in Jefferson and portions of Bullitt and Oldham counties which are in a nonattainment region currently experiencing problems meeting the 0.12 ppm one-hour ozone standard.

In the Louisville area, a Vehicle Emissions Testing program has been in operation since 1984 to help curb ozone pollution. In 1998, a tougher Vehicle Emissions Testing program was initiated in the county with the intent of reducing vehicle emissions another two million pounds per year. Despite these efforts, as well as a reduction of industrial ozone precursor emissions by 45% during the past seven years, Louisville has failed to meet the Nov. 15, 1998, deadline to comply with the one-hour ozone standard. Not meeting the standard could result in Louisville being reclassified from "moderate" to "serious" which carries stricter requirements curtailing economic growth. The Kentucky Division for Air Quality and the Jefferson County Air Pollution Control District are working with the U.S. EPA to formulate strategies to prevent this from occurring.

In 1997 the U.S. EPA determined that the existing air quality standard for ozone was not sufficient to protect human health with a reasonable margin of safety. The agency revised the ozone standard from 0.12 ppm to 0.08 ppm. Additionally, the new standard is averaged over eight hours rather than the highest daily one-hour reading used by the existing standard.

Sulfur Dioxide. Recognized as a precursor to acid rain and a public health threat, efforts to control sulfur dioxide (SO_2) have been ongoing for several years. The NAAQS for sulfur dioxide is being met throughout Kentucky, although the southern portion of Boyd County has not yet been redesignated as attainment.

In Kentucky, 91% of the 656,900 tons of industrial SO_2 emissions were emitted by power plants. The Clean Air Act Amendments of 1990 set a cap on SO_2 emissions that can be emitted by large sources, such as power plants, at about 40% of the amount released in 1980. As a result, total sulfur dioxide emissions released by the 23 power plants in Kentucky declined from 1.49 million tons in 1980 to 599,049 tons in 1997—a 60% drop. This was accomplished while the amount of coal burned at power plants increased 22.8%, from 31.1 million tons in 1980 to 38.2 million tons in 1997. A second round of SO_2 reductions will take place in the year 2000.

Nitrogen Oxides. High levels of nitrogen oxides (NO_x), a brownish mixture produced by fossil fuel combustion, are known to impair human health and contribute to the formation of acid rain and ground-level ozone. All of Kentucky is currently meeting the NAAQS for nitrogen dioxide.

However, indicators reveal that industrial emissions of nitrogen oxides from regulated sources have increased in Kentucky—from 334,600 tons in 1990 to 398,800 tons in 1997. Power plants accounted for 84% of the industrial NO_x emissions. Nitrogen oxide emissions from power plants increased 17.4% between 1980 and 1997—from 286,560 tons to 336,537 tons. While increasing emissions have not caused violations of the NO_x standard, they may be increasing acid deposition, regional haze, or ground-level ozone. In response to scientific evidence of long-range transport of ozone and its precursors, the U.S. EPA is calling for massive reductions in NO_x emissions throughout the eastern U.S.

Carbon Monoxide. Carbon monoxide is an odorless gas primarily emitted in the exhaust of vehicles. Trends reveal that air concentrations of carbon monoxide continue to decline in Kentucky due to pollution controls on automobiles. For example, levels fell by more than 50% between 1980 and 1997. All regions of the state currently meet the carbon monoxide standard.

Particulates. Particulates are small particles of dust, soot, liquids, and dirt in the air. These materials can become embedded in the lungs affecting breathing and lung functions. Particulates have been linked to lung cancer and premature death. Kentucky remains well below the federal standard for particulates less than 10 microns in diameter.

In 1997, the U.S. EPA issued new standards for particulates less than 2.5 microns in diameter. New $PM_{2.5}$ particulate monitors located in 18 counties will begin measuring for this pollutant in 1999.

Indoor Air Pollution. The U.S. EPA ranks indoor air pollution among the top five environmental risks to public health. Indoor air can be two to five times more polluted than outside air. There are many sources of indoor air pollution, including radon gas. Radon gas occurs naturally and can enter homes through cracks in foundations. Data reveals that 40% of the 27,977 homes tested in Kentucky by one company for radon gas had levels above the health advisory limits.

Ozone-Depleting Chemicals. Data from the 1996 Toxics Release Inventory reveal that 21companies in Kentucky released 7.25 million pounds of 14 ozone-depleting chemicals. Kentucky ranked top in the nation that year in on-site releases of chemicals associated with the destruction the the earth's stratospheric ozone layer.

Challenges Ahead. While most regions of Kentucky meet air pollution standards, achieving the new standards for ground-level ozone and particulates will pose significant challenges in the Commonwealth. Based on current data, it is estimated that 12 Kentucky counties have a very high probability of not meeting the new ozone standard. Four additional counties will likely have problems meeting the new ozone standard.

Power plants and other pollution sources will be required to reduce nitrogen oxide emissions under a new federal rule designed to reduce ground-level ozone. The U.S. EPA estimates that the new rule will reduce NO_x emissions by 1.1 million tons in the eastern U.S. by the year 2003. Kentucky will be responsible for cuts of about 75,000 tons. It is expected that coal-burning power plants in Kentucky will be required to cut NO_x emissions by 66% to meet this goal. Other sources will be called upon to reduce NO_x emissions as well.

Kentucky and other states also must begin to monitor and develop strategies to achieve the new $PM_{2.5}$ particulate matter standard. The new standard for particulates is directed toward particles having a diameter of 2.5 microns or less. These are the very smallest particles contaminating the air. Many of these very fine particles are not emitted directly into the air, but rather condense from gaseous emissions. Nitrogen oxides, for example, can condense into nitrates and become a particulate. Nitrogen oxide emissions also contribute to regional haze. The many impacts of NO_x emissions, coupled with the huge volume of those emissions, allows multiple health and environmental benefits from their control. New $PM_{2.5}$ monitors will be located near population centers and large combustion sources in 18 counties and will begin operations in 1999.

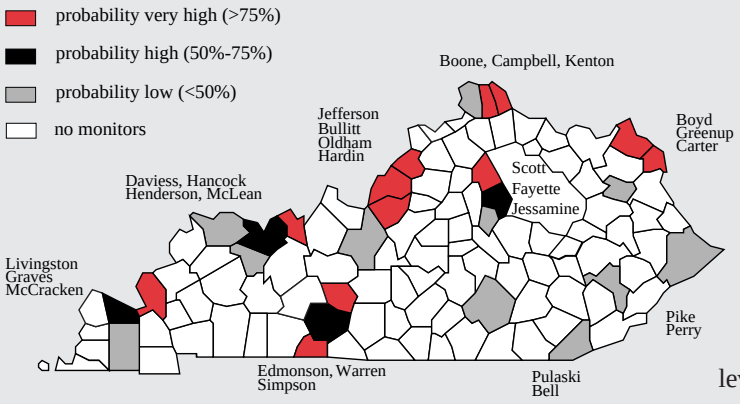
Other air quality challenges facing Kentucky include integrating risk assessment and risk management into the control of toxic and hazardous air pollutants, finding effective strategies for reducing indoor air pollution, and encouraging pollution prevention at the source.

Twelve Counties Will Have Trouble Meeting New Ground-Level Ozone Standard

Several Kentucky counties may have difficulty meeting a new stricter ground-level ozone pollution standard. Preliminary determinations indicate 12 counties will likely be in violation of the new 0.08 parts per million (ppm) eight-hour ozone standard and four counties will be close to exceeding the standard, based on 1995-97 monitoring data. However, final determinations will not be made until the year 2000, based on 1997-99 monitoring data.

The new national 0.08 ppm standard is designed to reduce health risks associated with ozone—a main ingredient of smog. Ozone can irritate the lungs, and cause breathing difficulties, especially in children and the elderly and people with respiratory problems such as asthma. The new rule will use the average ozone reading over an eight-hour period instead of the existing highest daily one-hour reading. Averaging ozone over a longer period of time can provide a better assessment of health impacts, since extended exposure to ozone at low levels can be more harmful than short-term exposure at high levels.

Probability of Kentucky Counties Not Meeting the New Ozone Standard (based on historical monitoring)



The new ozone standard will not have to be met for at least seven to 12 years. It is hoped that a required national cutback of industrial emissions of nitrogen dioxide by the year 2007, a precursor to smog, will help counties meet the new ground-level ozone standard.

" Kentucky is such a beautiful state, and when you take in all that scenery, then see a bottle just thrown to the side of the road, that kind of ruins it."

Amber Reed, Senior, Estill County High School
Speaking in support of a Kentucky bottle bill
Herald-Leader, January 6, 1998

Waste Management

Kentuckians enjoy a great diversity of products—from soda to disposable diapers. But there are hidden costs of our consumption of such a variety of goods, namely the production of household trash and hazardous waste. Kentuckians produce a great amount of garbage—16.7 million pounds a day to be exact. And millions of tons of hazardous waste are produced every year as by-products of manufacturing processes.

Solid Waste. Managing Kentucky's solid waste has long been a difficult task, but in the past decade the Commonwealth has made gains in ensuring its proper and safe disposal. For example, 56 substandard municipal solid waste landfills were closed after the passage of a 1991 state law requiring stricter construction and operating standards. Twenty-five state-of-the-art regional municipal solid waste landfills are currently permitted to provide 18.95 years of capacity.

All counties have enacted garbage collection ordinances, however, only 20 require mandatory participation. The number of Kentuckians participating in garbage collection has reached an all-time high in 1997, at 1.15 million households. It is presently not known how the remaining 25% of the state's households are disposing of their garbage since there is no reporting mechanism in place to track garbage disposal by those not participating in door-to-door collection.

While the exact amount of garbage illegally dumped is not known, thousands of open dumps attest to the fact that it remains a problem throughout the state. In 1996, the Natural Resources and Environmental Protection Cabinet initiated an Open Dump Campaign to stop illegal dumping. During 1997, county officials issued 7,806 open dump citations and cleaned up 3,043 open dumps at a cost of $4.1 million. State inspectors also issued 1,590 notices of violation that resulted in 490 dumps being cleaned up since 1997. A new tire amnesty program, to be held in every county during the next three years, should also help to clean up waste tire piles across the Commonwealth.

State, local, and individual efforts to recycle waste resulted in the diversion of 1.5 million tons of aluminum, newspapers, cardboard, paper, glass, and plastic materials away from landfills in 1997. The Kentucky Division of Waste Management estimates that 28% of the waste produced in the state is recycled. This is an improvement since 1990 when the recycling rate was 17%.

Hazardous Waste. During 1996 (the most recent year state data is available), 409 large quantity

Waste Management at a Glance

Solid waste generated per person (1997): 4.3 lbs/day
Waste disposed at MSW landfills (1997): 5.41 million tons
Households participating in curbside garbage collection (1997): 1.5 million (75%)
Dump cleanups reported by counties (1997): 3,043
cost of open dump cleanups : $4.1 million
Materials collected for recycling (1997): 1,530,823 tons
Hazardous waste generated (1996): 17.8 million tons*
Hazardous waste imported into Ky. (1996): 79 tons
Hazardous waste exported out of Ky. (1996): 174 tons
Contaminated waste sites (cumulative to date) (1997)
waste sites investigated: 1,288
waste sites with contamination: 1,255
waste sites cleaned up: 830
Federal Superfund sites (1997): 20
sites remediated: 7
Kentuckians living within 4 miles of a federal Superfund site: 290,155
Registered underground storage tanks (1998): 41,000
active tanks : 19,436
tanks closed: 23,000
active tanks not meeting standards (March 1999): 913
tank sites with contamination: 730
tank sites cleaned up: 637
*Per capita expenditures on waste management**: $5.16*

**Produced by large quantity generators.*
***Based on Div. of Waste expenditures (FY 1997-98).*

generators in Kentucky reported producing 17.8 million tons of hazardous waste.

Hazardous wastes are created as by-products of manufacturing processes. In addition, a significant amount of hazardous waste is generated during the remediation of spills as well as by service industries such as automotive repair. Federal and state rules require that hazardous waste be managed from the moment it is generated until it no longer poses a threat to human health or the environment. In Kentucky, 17.4 million tons of hazardous waste produced by major generators was considered exempt waste—primarily corrosive wastewater, the bulk of which was treated on-site to render it nonhazardous. Another 400,000 tons of hazardous waste generated in 1996 was classified as managed waste. Most of this waste required more sophisticated treatment or disposal. Currently, there are 36 facilities permitted in the state to treat, store, and dispose of hazardous waste.

Enforcing hazardous waste rules is a primary means to ensuring its safe management. Hazardous waste inspections dropped from 1,390 in 1996 to 532 in 1997, and violations cited fell from 146 in 1996 to 38 in 1997. The decline is attributed to a shift in enforcement priorities to open dumps and leaking underground storage tanks.

Contaminated Waste Sites. Each year hundreds of potential contaminated waste sites are discovered. These sites pose significant threats to our land, waterways, and drinking water supplies. To date, 1,898 potential contaminated waste sites have been identified in Kentucky. Of the 1,288 sites investigated, 1,255 have confirmed contamination, and 830 sites have been remediated by the state or responsible parties. Kentucky has also seen some progress in the cleanup of federal Superfund sites. Of the 20 Superfund sites, seven have had remediation completed and the sites are in long-term maintenance.

The Kentucky Division of Waste Management recently approved an initiative to promote the voluntary cleanup of waste sites. Through cooperative partnerships, the state allows willing parties to conduct site investigations and cleanups with state oversight. The intent of the program is to limit liability and spur cleanup in order to return waste sites to productive use. One site is presently under consideration for the voluntary cleanup program.

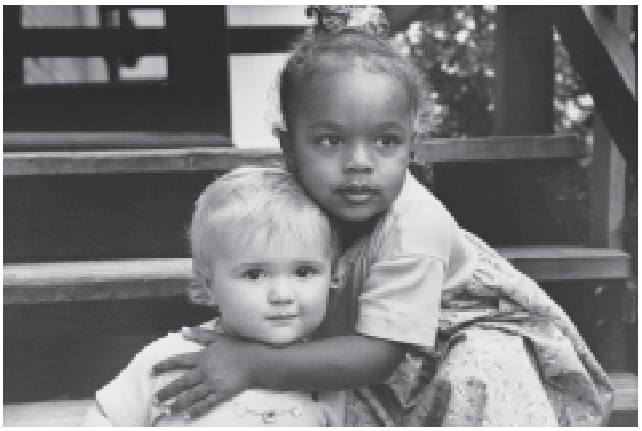
The state is also working with Louisville to clean up contaminated urban sites known as brownfields. The U.S. General Accounting Office estimates that there are 400,000 to 500,000 brownfield sites across the United States. Louisville has been selected as a national pilot project for brownfields revitalization. The goal of the project is to facilitate assessments and environmental cleanups of idled industrial land and to return it to productive uses. Site characterization activities have been completed at two brownfield properties in Louisville's heavy industry corridor.

Underground Storage Tanks. Leaking petroleum storage tanks have the potential to contaminate the environment. Since the Kentucky underground storage tank program began in 1986, 44,937 tanks have been registered and 27,688 have been removed or closed to prevent groundwater or soil contamination. Long-term contamination problems have been confirmed at 730 tank sites during the past 12 years, and 637 have been cleaned up or are involved in corrective action or routine monitoring. The rest of the sites are under investigation.

Challenges Ahead. The legacy of improper waste management can be found in almost every Kentucky community. Strong and consistent enforcement of the state's solid and hazardous waste laws and regulations are necessary to protect public health and prevent environmental degradation.

Efforts to strengthen participation in garbage collection programs and prevent the illegal dumping of waste will require the continued commitment of state and local officials. And cleaning up hundreds of contaminated waste sites will cost millions of dollars. The principal source of monies to cleanup contaminated waste sites, the Kentucky Hazardous Waste Management Fund, is slated to expire in the year 2000. The Hazardous Waste Management Fund, established in 1981, is financed through a fee on hazardous waste generators and collects about $2.2 million a year to help finance the clean up of contaminated waste sites in Kentucky. The renewal of this fund is urgently needed if Kentucky is to continue to make headway in remediating these sites.

Meeting the 1998 federal underground storage tank requirements for leak and spill detection will result in the state overseeing the closure of hundreds of tanks. As of March 24, 1999, 7% of the registered active tanks in Kentucky (913) did not meet the 1998 standards and must either close or upgrade their facilities. There are also hundreds of thousands of unregistered underground storage tanks that pose a threat to the environment. A number of unregistered tanks are discovered each day at old or abandoned gas stations by Kentucky Division of Waste officials. Many of these old tanks have leaked and contaminated soil and water resources.



" Many leading health experts suspect that toxins found in our environment may very well play a role in the growing incidence of certain childhood cancers."

Carol Browner, Administrator
U.S. Environmental Protection Agency
Conference on Preventable Causes of Childhood Cancer
September 15, 1997

Reducing Toxic Risks

Some 75,000 synthetic chemicals have been registered for commercial use during the past 50 years. And an estimated 2,000 new chemicals are introduced annually. While these chemicals form the basis for many of the products we use every day—from toothpaste to gasoline—their impact on the environment and public health is just beginning to be uncovered. Cancer rates among children have been rising for decades (an increase of an average of 1% annually, according to the National Cancer Institute). Leading health experts strongly suspect that toxins in the air, food, dust, soil, and drinking water may very well play a role. Today, a newborn child faces a risk of about one in 600 of contracting cancer by age ten.

Toxic products used in the home can be a health risk as well. In 1997, the Kentucky Regional Poison Center received 47,247 calls, 65% of which involved small children. Exposure to cleaning products, industrial chemicals, pesticides, and hydrocarbons resulted in 8,953 calls to the Poison Control Center.

Toxic Chemicals. Managing toxic chemicals to reduce public health and environmental risks has received greater national attention during the past decade. The federal Emergency Planning and Community Right-To-Know Act was passed in 1986. A key component of the act is the Toxics Release Inventory (TRI) which requires certain manufacturers that employ ten people or more to self-report to the public the generation and release of 600 toxic chemicals into the air, water, and land.

During 1996, the most recent year for which data is available, 429 facilities in Kentucky reported generating 577 million pounds of TRI toxic chemical by-products. Most of these toxic chemicals generated—about 80%—were treated or recovered at the site of generation. About 8% (47.4 million pounds) of the 577 million pounds of toxics generated during 1996 was released directly into the environment, with 87% (38 million pounds) being released to the air. A review of the top five TRI chemicals released by volume to the environment in Kentucky reveals that all, at certain levels and doses, can cause acute toxicity from a single exposure, three can impair development and reproductive functions, and one is a possible human carcinogen.

EQC also reviewed the generation of 17 TRI "priority" toxics considered highly toxic, cancer-causing, or used in great volumes that pose significant environmental risks. Data reveal that Kentucky industries have reduced the generation of these 17 priority chemicals from 31.8 million pounds in 1987 to 12.7 million pounds in 1996—a 60% decline.

Toxic Chemical Spills. Each year millions of gallons of toxic and hazardous substances are accidentally spilled in the U.S. along transportation routes and at industrial sites. Industries and others

Toxics at a Glance

TRI facilities reporting in Ky. (1996): 429*
Generation of TRI chemicals (1996): 577 million lbs.
Release of TRI chemical to environment (1996): 47.4 million lbs.
Top counties with TRI releases (1996): Jefferson, Marshall, Woodford, Hancock, Simpson, Logan, Ballard, Scott
Top facilities releasing TRI chemicals (1996): DuPont, Koppers Ind., Air Products and Chemicals, Ford Motor Co., Elf Atochem, Toyota Motors, Osram Sylvania, Westvaco, American Synthetic Rubber, Imco.
*Release of 17 priority toxics** (1996): 12.7 million lbs.*
Reduction of 17 priority toxics (1988 to 1996): 60%
Hazardous material spills in Ky. (1998): 4,327
Screenings of children for lead poisoning (1998): 35,576
children with acute lead poisoning: 327 (1%)
children with blood lead levels of concern: 4,220 (12%)
Ag. pesticides sold in Ky. (1997): 9.34 million lbs.
Certified pesticide applicators: 59,190
Samples of Ky. produce tested for pesticides (1997): 118
samples with pesticide residues detected: 0

**Toxics Release Inventory - certain companies must report toxic chemical generation, transfers, and releases.*
***17 TRI chemicals targeted for reduction by the U.S. EPA.*

handling these materials are required to report spills and accidental releases to the state and other agencies. Spill incident notifications received by the Kentucky Department for Environmental Protection's Environmental Response Team have increased from one report a day in 1983 to 11 a day in 1998. The rise in reported spills is attributed to an increase in transportation activity due to a stronger economy, tightening of reporting requirements for leaking underground storage tanks and other sources, and greater awareness of reporting requirements.

Pesticides. Each year millions of pounds of pesticides are applied to farmlands, golf courses, highway and utility right-of-ways, and lawns. In Kentucky, an estimated 8.9 million pounds of pesticide products were sold for use on agricultural crops during 1997. Another 631,701 pounds were used on lawns according to records obtained from 286 lawn care companies, golf courses, and private right-of-way commercial applicators.

The use of agricultural chemicals has increased in recent years—a reflection of higher crop production levels. While various programs have been in place to promote the reduction of agricultural chemicals, trends show no significant decline in the use of agricultural chemicals in Kentucky. A state program to collect old agricultural pesticides has been underway since 1995. To date, 121,600 pounds of pesticides have been collected under this program.

Safe Food. Concerns about the safety of food supplies led to the passage of the federal Food Quality Protection Act of 1996. The act strengthens the system that regulates pesticide residues in food and includes greater protections for children.

The Kentucky Department for Public Health randomly tests produce for pesticide residues. During 1996 and 1997, 202 samples of Kentucky-grown produce were tested. One sample detected pesticide residues above the tolerance standard established to protect public health. Nationwide, 34% of the food tested had detectable pesticide residues, 1.4% above safe limits.

Lead Poisoning in Children. Though banned from gasoline and paint, lead remains a significant health risk to children. It is estimated that one in 11 children nationwide has high levels of lead in his/her blood. Lead is particularly harmful to a child's developing brain and nervous system, causing reading and learning disabilities, reduced attention span, decreased growth, and even brain damage. Lead-based paint in older homes has become the primary source of lead exposure for children.

During 1998, local health departments conducted 35,576 blood screenings of children under the age of six. The tests found that 327 children (1% of those tested) had lead levels high enough to cause severe health problems and 12% had levels of concern.

Challenges Ahead. Reducing the generation and release of toxic chemicals is critical if Kentucky is to minimize health and environmental threats. The need to set quantifiable reduction targets for toxic chemicals at the state and community level is among the challenges facing Kentucky. Many pollution prevention experts, including those at the Kentucky Pollution Prevention Center, also agree that incentives as well as disincentives are needed to encourage further reduction of toxic chemicals. The Pollution Prevention Center works with companies to find cost effective pollution prevention solutions. During FY 1997-98 the center trained 2,600 people and conducted 39 on-site pollution prevention assessments.

Potential Health and Environmental Effects of Top 5 TRI Chemicals Released (by Volume) to Kentucky's Environment

	Pounds (1996)	acute	cancer	chronic	developmental	reproductive	neurotoxic	ecotoxic	smog	ozone depleter
Methanol	5,203,904	x		x	x	x	x	x		
Xylene (mixed isomers)	4,479,586	x					x			
Chlorodifluoromethane	4,289,701	x			x	x	x			x
Toluene	3,948,228	x		x	x	x	x	x	x	
Creosote	3,454,889	x	x	x				x		

Acute toxicity: toxicity that results from a single exposure. Cancer: potential human carcinogenic effects based on current classification by U.S. EPA. Chronic toxicity: toxicity that results from repeated exposure over a long period. Developmental: causing fetal developmental defects. Reproductive: causing reduced fertility or infertility, miscarriages. Neurotoxic: effects to the nervous system. Ecotoxic-chemicals that are toxic to aquatic and terrestrial organisms, both natural and agricultural. Smog: ground-level ozone precursor. Ozone depleter: release linked to the thinning of the ozone layer. Source: Ky. DEP Risk Assessment Branch, Toxics Release Inventory Report, U.S. Agency for Toxic and Disease Registry, Federal Hazardous Substances Database

Chapter 1

Drinking Water

Indicator 1: Public Drinking Water Quality

Figure 1

Public Drinking Water Systems in Kentucky and Violation Trends

Facility Size (Population Served)	Number of Systems* 1993	1995	1997	Number of Systems w/Violations** 1993	1995	1997	Number of Drinking Water Violations**(percent total) 1993	1995	1997
<101	220	207	168	130	138	68	733(46%)	620(47%)	289(40%)
101-500	188	162	145	90	109	58	436(27%)	408(31%)	227(31%)
501-1,000	65	59	55	19	32	19	80 (5%)	77 (6%)	50 (7%)
1,001-2,500	132	132	128	64	52	35	129 (8%)	111 (8%)	72 (10%)
2,501-3,300	46	46	45	30	18	9	59 (4%)	26 (2%)	14 (2%)
3,301-5,000	47	47	47	23	13	8	50 (3%)	24 (2%)	13 (2%)
5,001-10,000	80	80	80	41	21	24	80 (5%)	37 (3%)	39 (5%)
10,001-50,000	57	58	57	25	18	15	35 (2%)	21 (2%)	20 (3%)
50,001-100,000	3	3	3	1	1	1	1(<1%)	1(<1%)	1(<1%)
>100,000	2	2	2	0	2	2	0	2(<1%)	4 (<1%)
Total	**840**	**796**	**730**	**423**	**404**	**239**	**1,603**	**1,327**	**729**

**Includes public community, noncommunity, and non-transient systems. **Includes violations of drinking water standards (MCLs), monitoring, and reporting violations. Does not include Phase II and V chemical testing results or bottled water facilities. Percents rounded. Source: Ky. Div. of Water*

Background The federal Safe Drinking Water Act of 1974 and its amendments regulate the nation's public drinking water to ensure it is safe for consumption. An estimated 3,075,623 Kentuckians (82%) now has access to public drinking water provided by 730 public drinking water systems. Kentucky assumed authority in 1977 from the U.S. Environmental Protection Agency (EPA) to implement the provisions of the Safe Drinking Water Act. While drinking water supplied by public water systems is generally considered safe for consumption, there still are problems. Tracking the number of public drinking water systems with violations can provide an indication of the quality of the Commonwealth's public drinking water.

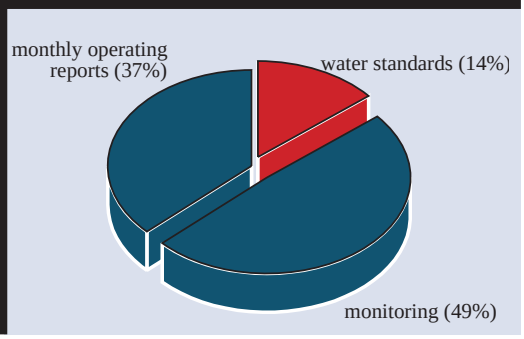
Source Pollutants can enter raw drinking water sources in a number of ways and come from a variety of sources. In Kentucky, polluted runoff from farmlands and coal mines and discharges from wastewater treatment plants are the greatest source of water pollution. Other pollution sources include failing septic systems, sewage straight pipes, waste sites, urban runoff, combined sewer overflows, and toxic spills.

Goal Ensure public drinking water can be safely consumed by meeting federal and state Safe Drinking Water Act rules and regulations that specify 83 health-based Maximum Contaminant Levels (MCLs), 14 secondary standards, monitoring and reporting requirements, and treatment techniques.

Progress In 1993, 50% of the state's public drinking water systems had one or more violations of Safe Drinking Water rules. By 1997, the percent of systems in violation had dropped to 33%, a significant improvement in five years. Forty-nine percent of the violations cited during 1997 were failure to properly monitor while 37% were reporting infractions. Fourteen percent of the 729 violations cited in 1997 were for exceeding MCL health-based drinking water standards. It should be noted that data from Phase II and Phase V chemical monitoring for 1993 through 1998 has not been compiled

Figure 2

Types of Public Drinking Water System Violations in Ky. (1997)



Note: Based on 687 violations. Does not include Phase II and V chemical testing results. Source: Ky. Division of Water

by the Kentucky Division of Water and is not included in the above numbers.

Small public water systems remain the greatest violators of drinking water regulations. A small system is defined as serving fewer than 3,300 people. These systems accounted for 90% of the drinking water violations in 1997. Many of these systems do not have the expertise, equipment, or resources to meet various requirements of the Safe Drinking Water Act. The Kentucky Division of Water has encouraged mergers of small nonviable systems in an effort to improve drinking water quality. Between 1979 and 1998, 555 drinking water system mergers have occurred. There are approximately 26 mergers per year.

These mergers have eliminated a number of poorly operated plants. But problems remain. For example, during 1997, 13 public water systems serving a total of 3,852 people were in significant noncompliance—up from the ten systems EQC reported in 1996. Significant noncompliance means that a system had 12 or more violations of Safe Drinking Water Act rules in 12 consecutive months.

Under the Safe Drinking Water Act Amendments of 1996, all states are required to develop a Source Water Assessment Program (SWAP). A key component of Kentucky's SWAP is to assess a water source's susceptibility to contamination. Currently, 183 systems in Kentucky depend on groundwater for public drinking supplies. These 183 systems serve 572,950 Kentuckians. Thirty of the 183 community drinking water systems are in the process of developing wellhead protection plans. Of these 30, three communities have fully implemented their wellhead protection plans.

There are also 262 noncommunity systems serving mobile home parks, restaurants, schools, campgrounds, and state parks that rely on groundwater for drinking water supplies. These systems serve an estimated 45,373 people. Currently, 28 of these systems, serving a total of 1,251 people, are in the process of developing wellhead protection plans to protect groundwater supplies.

Figure 3

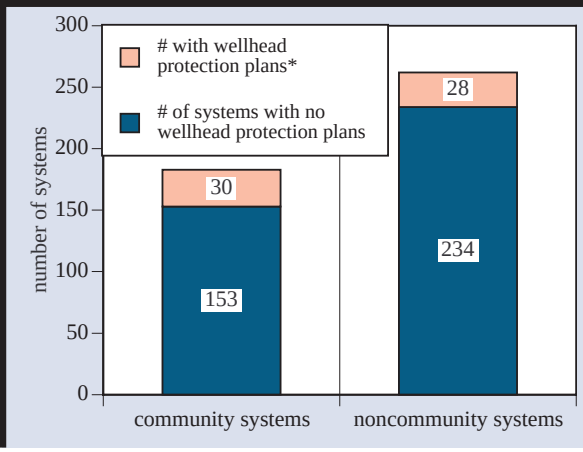
Public Drinking Water Systems in Ky. in Significant Noncompliance (1997)

Water System	County	Population Served
Kettle Island Water System*	Bell	396
Stoney Fork	Bell	125
Hillside Trailer Park	Boone	150
Wildwood Estates	Breckinridge	69
Keniana Homeowners Assoc.	Calloway	132
Isonville Elementary	Elliot	140
River's Edge Campground	Gallatin	122
Blue Diamond Camp*	Harlan	59
Wallace Farm	Jefferson	70
Jackhorn Water Supply*	Letcher	200
Millstone Water Co.*	Letcher	90
Whitesburg Municipal Water	Letcher	2,224
Upper Levisa Health Clinic	Pike	75
Total 13	**10**	**3,852**

*Note: As of April 1, 1998. Significant noncompliance defined as systems with 12 or more violations in a running year. *Indicates water system was a significant noncomplier in the 1996/97 EQC report. Source: Ky. Division of Water*

Figure 4

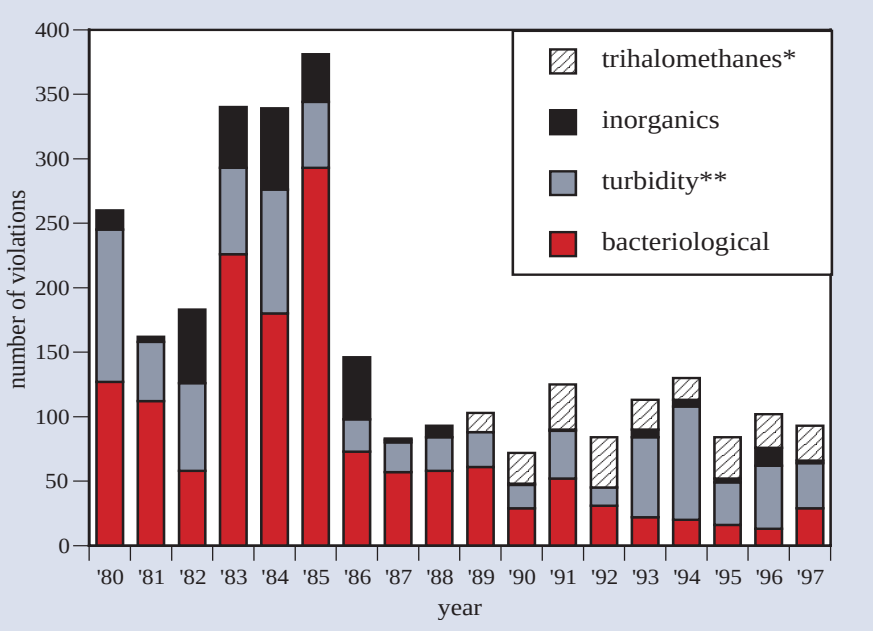
Drinking Water Systems in Kentucky with Wellhead Protection Plans



*Note: Based on systems dependent on groundwater as a drinking water source. As of Dec. 1998. * Plans approved or under development. Source: Ky. Div. of Water*

Indicator 2: Contamination of Public Drinking Water

Figure 5 Public Drinking Water Violations in Kentucky (MCLs)



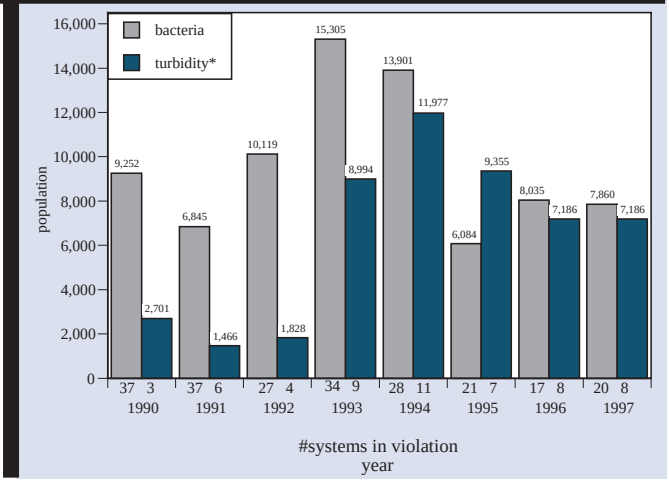
*Note: Based on violations of Maximum Contaminant Levels (MCLs) drinking water standards. *Trihalomethane monitoring not required prior to 1989. **More stringent turbidity standards took effect in 1993. Does not include monitoring and reporting violations for Phase II and V contaminants.*
Source: Ky. Division of Water

Background While public drinking water in the United States is considered among the safest in the world, its safety cannot be taken for granted. Violations of Safe Drinking Water Act standards continue to occur in Kentucky and pose risks to public health. For example, in September 1998, 8,000 residents of Logan County were boiling tap water after nematodes (microscopic worms) and Cryptosporidium and Giardia (pathogenic organisms) were detected in finished drinking water treated by the Russellville water treatment plant. Monitoring drinking water violation trends provides a strong indicator of how effective programs are protecting drinking water supplies.

Source The most common drinking water contaminants detected in Kentucky are bacteria (an indication water may be contaminated with fecal matter); turbidity or cloudiness (which can interfere with the treatment process and allow pathogens to survive); trihalomethanes (organic chemicals created during the disinfection of water with chlorine); and inorganics (which include nitrates and metals such as mercury and barium).

Goal Ensure public drinking water can be safely consumed by meeting federal and state Safe Drinking Water Act rules and regulations that specify 83 health-based Maximum Contaminant Levels (MCLs).

Figure 6 Population Served by Public Water Systems in Kentucky with Persistent Violations



*Note: Persistent violators are systems with four or more monitoring or MCL violations in any 12 month period. *More stringent turbidity standards took effect in 1993.*
Source: Ky. Division of Water

PROGRESS Trends reveal that violations of health-based MCL drinking water standards have declined significantly during the past 17 years in Kentucky. Of the 730 public drinking water systems operating in the state, 4%, or 34 systems, had MCL violations in 1997. The MCL violations cited in 1997 include: 29 bacteriological, 35 turbidity, 27 trihalomethanes, and two inorganics. In addition, the state cited 36 violations for inadequate treatment techniques and two for failure to filter. It should be noted that data from Phase II and Phase V chemical monitoring, which took place between 1993 through 1998 has not been compiled by the Kentucky Division of Water and is not included in the above numbers.

There are several facilities that are known persistent violators of MCL drinking water standards. During 1997, an estimated 38,799 Kentuckians were at risk from 27 public drinking water systems with persistent violations of bacteria and turbidity standards. Data reveal that there has not been any significant improvement in reducing the population at risk by persistent violators during the past three years.

Efforts to bring these and other drinking water systems into compliance continue. While a majority of violations cited at drinking water plants are resolved, some result in fines. In 1997, ten drinking water systems were fined a total of $16,950.

Figure 7

Persistent Water System Violators of Safe Drinking Water Act Standards

Facility	County	Pop. at risk
Kettle Island	Bell	396
Henderson Settlement	Bell	105
Hillside Trailer Park	Boone	150
Augusta Regional WTP	Bracken	1,801
Shouses MHP#2	Breathitt	35
Irvington Water System	Breckinridge	1,603
Wildwood Estates	Breckinridge	69
Hardinsburg/Rough Riv. Plant	Breckinridge	9,363
Lakeway Shores	Calloway	204
Green Acres Mobile Home Ct.	Carroll	92
Cumberland Co. Water Dist.	Cumberland	6,111
Imperil Mobile Home Park	Franklin	482
Evarts Municipal Water Plant	Harlan	2,121
Wallins Water System	Harlan	1,204
Blue Diamond Camp Water Syt	Harlan	59
Caney Creek Water District	Knott	343
Jamestown Village MHP	Knott	327
Whitesburg Mun.Water Works	Letcher	2,224
Jackhorn Water Supply	Letcher	200
Island Water Dept.	McLean	1,614
Brandenburg Water Works	Meade	3,283
Bloomfield Water/Sewage	Nelson	2,664
Tara Springs	Oldham	25
Tri-Village Water District	Owen	3,626
Glenwood Hall Resort	Owen	613
New Tribes Mission	Perry	60
Cumberland Mtn. Spring Water	Pike	25
Total 27	**19**	**38,799**

Note: Includes community water systems with monitoring, reporting and MCL violations. List does not include 12 transient and 1 non-transient plants listed as persistent violators. Persistent violators are systems with four or more monitoring or MCL violations in any 12 month period. As of September 1998. Source: Ky. Division of Water

Figure 8

Drinking Water Systems Assessed Fines in Ky.

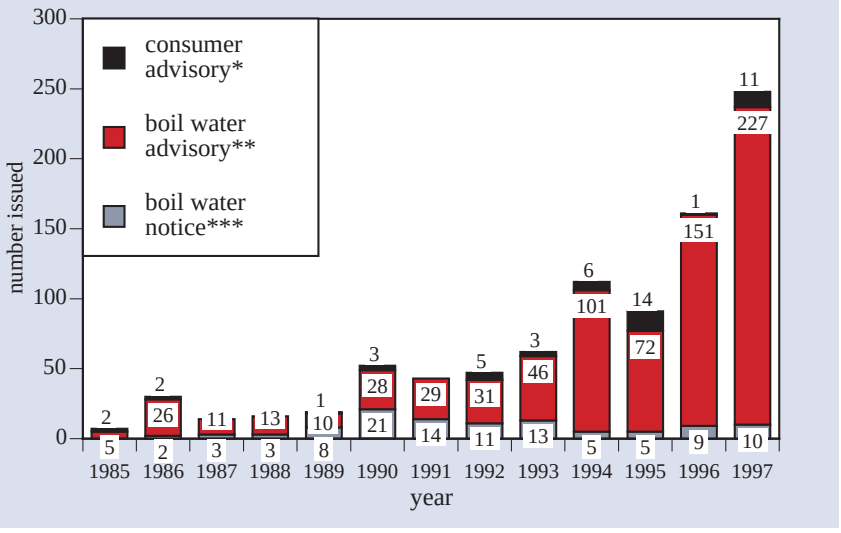
Year	#Systems	Fines*
1990	11	$41,585
1991	18	$59,950
1992	28	$69,825
1993	22	$71,125
1994	31	$62,300
1995	24	$44,375
1996	19	$66,850
1997	10	$16,950

*Note: Includes drinking water and water quality violations. *Includes total civil and performance penalties assessed by calendar year. Source: Ky. Division of Water*

Indicator 3: Boil Water Notices and Advisories

Figure 9

Drinking Water Advisories and Notices in Kentucky



*Issued when possible adverse health effect from consumption of water or when other information of interest to consumer exists. **Issued when there is potential for bacteriological contamination. ***Issued when evidence shows bacteriological contamination. Source: Ky. Division of Water

Background Bacteriological contamination is one of the most common violations of public drinking water standards. While violations of bacteriological drinking water MCL standards have declined during the past 17 years, the number of potential contamination incidents leading to boil water advisories has increased in recent years. The number of boil water notices and advisories provides an indication of drinking water quality in Kentucky.

Source Most drinking water advisories and notices are issued because of water line breaks. In many areas, drinking water distribution systems have not been maintained, resulting in deterioration, leakage, and failure. Some water systems in Kentucky lose as much as 50% of their treated water due to leaks and water line breaks, according to reports filed with the Kentucky Public Service Commission. Deteriorating pipes not only can cause water loss, but can be dangerous because of infiltration of contaminants during pressure losses.

Goal Ensure public drinking water can be safely consumed by ensuring that boil water advisories and notices are promptly issued.

Progress In 1997, there were 227 boil water advisories (issued when there is a potential for contamination) and ten boil water notices (issued when bacteriological contamination is confirmed), a dramatic increase from previous years. Although the exact reason for the increase in the number of boil water advisories cannot be determined, the Kentucky Division of Water generally attributes the rise to better education and awareness of water system operators and more consistent reporting of water line breaks.

Grayson Utilities (Carter County) led the state in boil water notices with 16, followed by Greenup Water Plant (14), Pineville Water System (13), Olive Hill Municipal Waterworks (13) and Flatwoods (11). These systems accounted for 30% of the 227 boil water advisories issued in 1997. Boil water notices were issued in Carroll, Garrard, Knox, Jessamine, Meade, Pendleton, and Taylor counties during 1997. Water systems in Grayson County (Grayson Co. Water District), Harlan County (Evarts Municipal Water Plant and Green Hills Water District), and Henderson County (Henderson Water Plant) had consumer advisories issued in 1997.

Boil water notices and advisories usually last a few days. However, some communities have experienced long-term advisories. For example, Evarts in Harlan County has had boil water advisories since 1994 due to turbidity problems. In August 1998, the city declared an emergency in order to be eligible for federal funding to resolve problems at the drinking water plant.

Indicator 4: Private Drinking Water Wells

Background Some 700,000 Kentuckians rely on private wells, springs, or cisterns for drinking water, according to the 1990 U.S. Census. In Kentucky and many other states, private drinking water sources are not required to be monitored for contamination, so it is not possible to determine the overall quality of this resource.

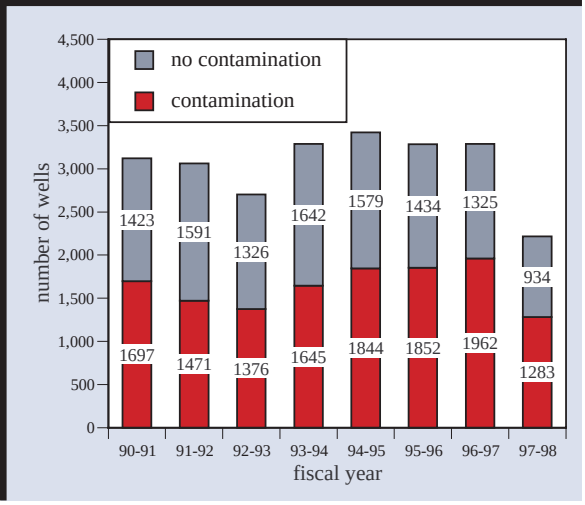
Source Groundwater fed drinking water supplies have many potential sources of contamination. Sources include leaking underground storage tanks, raw sewage from failing septic systems, straight pipes, and agricultural operations. Because large sections of Kentucky have karst topography, surface water and groundwater often mix, increasing the likelihood of groundwater contamination. Hand-dug and improperly constructed water wells are more susceptible to contamination.

Goal Ensure drinking water from private wells can be safely consumed by ensuring proper well construction and maintenance.

Progress A review of individual water wells tested by local health departments upon request by the well owner reveals 55% of the 2,216 water wells sampled during fiscal year 1997-1998, tested positive for total coliform bacteria—an indication the well may be contaminated. Contamination detected in water wells may not necessarily indicate the groundwater is polluted but rather might be the result of poor well construction, maintenance, or problems with home distribution systems. According to state health officials, many private water wells are not routinely tested or properly maintained.

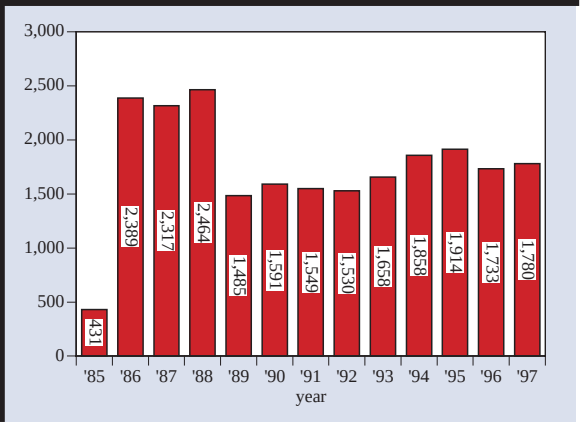
Kentucky has made progress in ensuring the safe construction of water wells. Since 1985, state regulations have required all water well drillers to be certified. Currently, 190 drillers are certified in Kentucky. During fiscal year 1997-98, 1,780 new domestic water wells were drilled in the state, according to state water well records.

Figure 10 Voluntary Testing of Private Drinking Water Wells in Ky. for Bacteria



Note: Tests of private wells for total coliform bacteria. All tests are requested by well owners.
Source: Ky. Department for Public Health

Figure 11 Number of Water Wells Reported Drilled In Kentucky



Note: Includes private drinking water, municipal, livestock, and irrigation wells.
Source: Ky. Division of Water

Indicator 5: Drinking Water Infrastructure/Supplies

Background Most of Kentucky's and the nation's drinking water infrastructure is more than 30 years old and many systems now require upgrades and improvements. The U.S. EPA recently completed a nationwide drinking water infrastructure needs survey. They discovered that 55,000 systems are in need of $12.1 billion in immediate upgrades to comply with the current requirements of the Safe Drinking Water Act. The total cost to repair and upgrade the drinking water infrastructure in the U.S. over the next 20 years is estimated at $138.4 billion.

Figure 12
Drinking Water Infrastructure Needs in Kentucky by System Size (1995)

System Size	Number*	Needs ($ millions)
Large	4	$ 612.2
Medium	178	$1,015.7
Small	521	$ 596.3
Total	**703**	**$2,224.2**

**Based on number of systems surveyed in 1995.*
Source: U.S. EPA

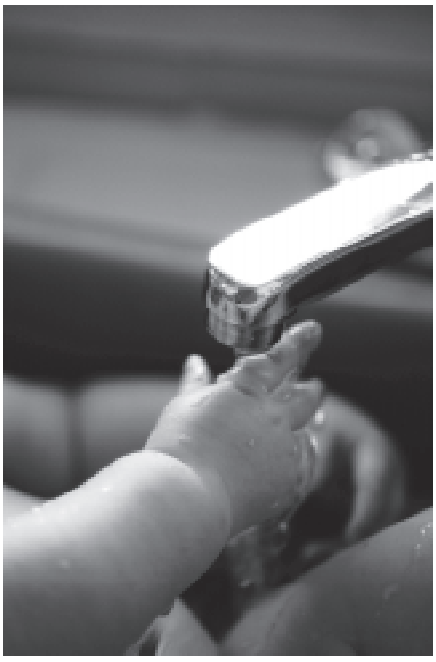
Source The Kentucky Division of Water indicates that most small to medium sized drinking water systems in the state are in need of repair or upgrading.

Goal Improve and maintain drinking water infrastructure, develop a statewide strategic plan designed to ensure that every household in Kentucky has access to potable water by 2020 (Executive Order 96-1339), and require water suppliers develop long-range water supply plans by July 15, 1998, later amended to July 15, 1999 (KRS151.114-118).

Progress Kentucky has made great progress during the past 50 years in building the infrastructure necessary to provide Kentuckians with safe and dependable supplies of public drinking water. Efforts to upgrade water treatment plants and distribution systems progress. Each year millions of dollars in grants and loans are invested in drinking water infrastructure. However, drinking water systems in Kentucky still need and estimated $116.7 million in repairs just to meet the requirements of the Safe Drinking Water Act and another $2.1 billion in improvements over the next 20 years. In 1996, Congress amended the Safe Drinking Water Act to provide states with $9.6 billion to help communities finance badly needed drinking water improvements. Kentucky was allocated $12.85 million in 1997 and $12.5 million in 1998, from a federal capitalization grant to set up a low-interest state revolving loan fund to finance drinking water repairs. Kentucky matched the grant by 20% as required by federal law. It is anticipated that the 1997 monies will initially fund 11 drinking water projects in Kentucky.

In an effort to provide all Kentuckians with access to safe drinking water, Governor Paul Patton created the Water Resources Development Commission in 1996. The Commission is mandated to develop a strategic plan designed to deliver access to potable water to an estimated 700,000 Kentucky households not presently served by a public water system. The Commission works with other state agencies to promote the use of geographic information systems and related technologies to provide drinking water systems with the tools necessary for more effective and efficient water service. The Commission recently completed a survey of 639 drinking water facilities and related infrastructure to determine the size and service potential of these systems.

Many public drinking water systems are also planning for their long-term water supply needs. In 1990, the Kentucky General Assembly passed a law mandating long-range water supply plans be developed by July 15, 1998 (later extended to July 15, 1999). Currently, all but 18 water suppliers have developed or are in the process of developing water supply plans.



Chapter 2

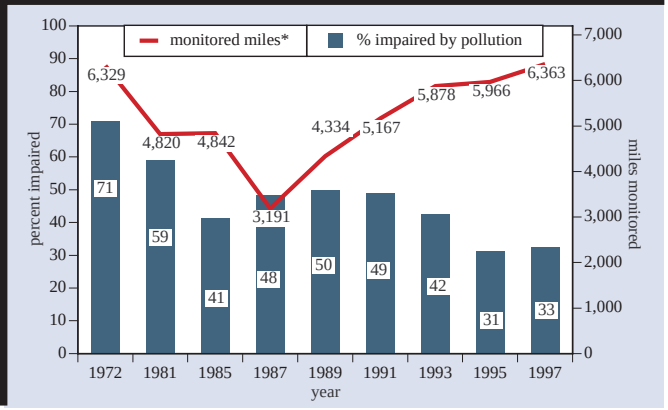
Water Quality

Indicator 1: Water Quality of Rivers, Streams

Background Kentuckians enjoy the benefits of an estimated 89,431 miles of rivers and streams. The quality of these waterways varies from severely degraded to clean enough for swimming, fishing, or use as a drinking water supply. The Kentucky Division of Water maintains a network of 44 ambient water quality stations throughout the state to monitor water quality. In 1997, these stations monitored 7% of the 89,431 stream and river miles for 32 different parameters. While this data may not represent a statistically valid sample of water quality statewide, it does provide a general indicator of water quality trends and pollution sources in Kentucky.

Figure 1

Percent of Kentucky Waterways Impacted by Pollution



Note: Based on monitored river and stream miles. 1972 and 1981 data include river and stream miles monitored and evaluated. Source: Ky. Reports to Congress on Water Quality

Source In 1997, agricultural activities were the leading source of water pollution in monitored waterways. Contaminated runoff containing agricultural nutrients and chemicals is impacting 20% of the polluted stream miles. Coal mining activities (active, inactive, and abandoned mines combined) impacted 19% of the miles impaired, while sewage treatment plants impacted 17% of the monitored waterways. Disease-carrying pathogens, often associated with untreated or poorly treated animal and human waste, remains the principal pollutant, impairing 31% of the monitored stream miles. In 1998, the state declared that 234 miles of Kentucky's rivers and streams were too polluted for swimming because of high levels of fecal coliform bacteria. Fecal coliform in water indicates the possible presence of pathogens in the water which can cause ailments such as diarrhea and Hepatitis A if ingested or absorbed through the skin.

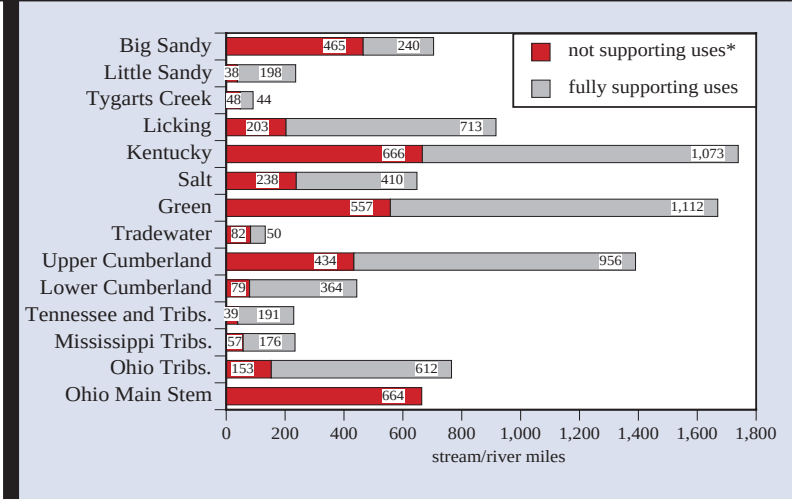
Goal Safeguard from pollution the uncontaminated waters of the Commonwealth; prevent the creation of any new pollution of the waters of the Commonwealth; and abate any existing pollution per KRS 224.70-100.

Progress Efforts to restore Kentucky's waterways have been ongoing since the passage of the federal Clean Water Act in 1972. During the past 25 years, progress has been made in improving water quality in the state. For example, in 1972, 71% of the monitored waterways were impaired by pollution compared to 33% in 1997.

A review of ambient water monitoring data reveals that several waterways remain significantly degraded by pollution. For example, a 664-

Figure 2

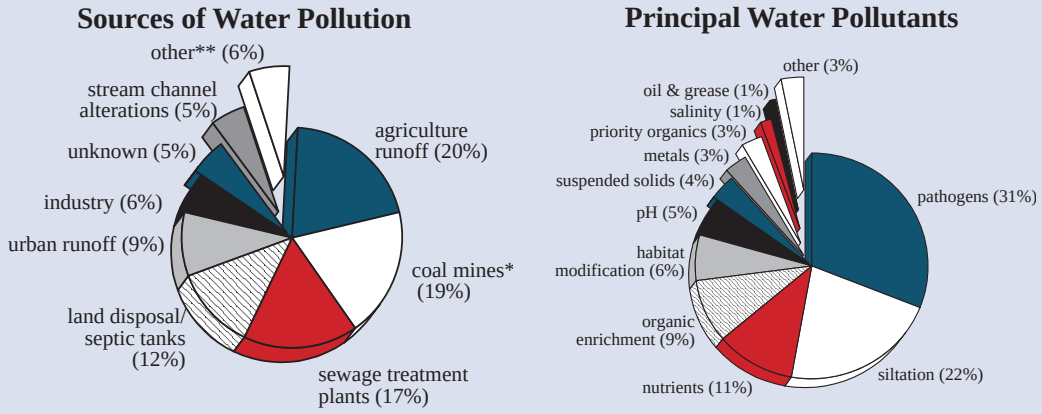
Monitored Stream and River Miles in Kentucky Impacted by Pollution, by River Basin (1997)



*Note: Based on monitored and evaluated waterways. * Miles not or partially supporting one or more uses (swimming, fishing, drinking water). Source: Ky. Division of Water*

Figure 3 Sources of Water Pollution and Principal Pollutants in Kentucky (1997)

Note: Percentages differ from previous State of Kentucky's Environment reports due to the addition of stream and river miles with minorand major pollution impacts (previous reports only listed miles with major pollution impacts). Many waterways have multiple sources of pollution which are reflected in this chart. Source: Ky. Div. of Water



**Water pollution from active, inactive, and abandoned mines combined. **Logging, construction, development, combined sewer overflows.*

mile stretch of the Ohio River bordering Kentucky still does not meet or only partially meets its swimmable and fishable uses. And half of the stream and river miles monitored within the Big Sandy, Tygarts Creek, and Tradewater River basins are not supporting various uses due to pollution. The North Fork of the Kentucky River remains one of the most polluted waterways in the state based on miles polluted and uses impaired.

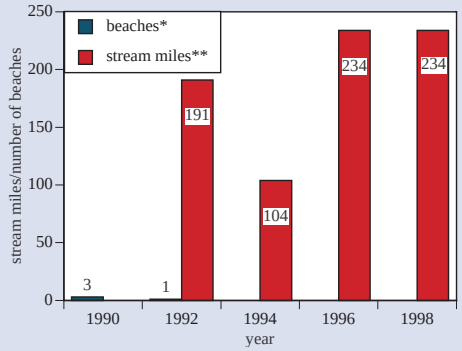
State efforts are now underway to better target water pollution problems by watershed. The Kentucky Watershed Management Initiative will coordinate state, federal, and local pollution control efforts by watershed. Kentucky's 13 watersheds have been grouped together in five Basin Management Units (BMU) as follows:

Study Year	Basins
1998	Kentucky River
1999	Salt and Licking Rivers
2000	Cumberland, Tenn., Mississippi Rivers
2001	Green and Tradewater Rivers
2002	Big & Little Sandy Rivers, Tygarts Creek

Each BMU will be monitored extensively every five years. The intent is to gain a better understanding of overall conditions and pollutants impairing various watersheds, target pollution problems, involve various agencies and the public in the design of effective solutions, and measure success through monitoring and data gathering.

Figure 4 Swimming Advisories in Kentucky

*Note: Intensive surveys of selected waterways began in 1990. *No beach closures in 1994-98. **Advisories were also issued for all urban waterways. Source: Ky. Div. of Water, Ky. Department for Public Health*



In 1998 swimming advisories were reissued along the Upper Cumberland River, Licking River, North Fork of the Kentucky River.

Figure 5 Top Ten Polluted Waterways in Kentucky (1997)

Stream	County/River Basin	Miles Impaired
North Fork Ky. River	Multicounty/Kentucky	87.4
Floyds Fork	Multicounty/Salt	54.2
Levisa Fork	Multicounty/Big Sandy	46.3
Fleming Creek	Fleming/Licking	39.2
Little River	Multicounty/L. Cumb.	37.4
Tug Fork	Martin/Big Sandy	31.4
Pond/Fern Creek	Jefferson/Salt	29.8
Banklick Creek	Kenton/Licking	19.0
Roaring Paunch Ck.	McCreary/U. Cumb.	15.6
S. Fork Beargrass Ck.	Jefferson/Ohio	14.6

Note: Based on monitored waterways not supporting two or more uses by most miles impaired. Source: Ky. Div. of Water

Indicator 2: Water Quality of Lakes

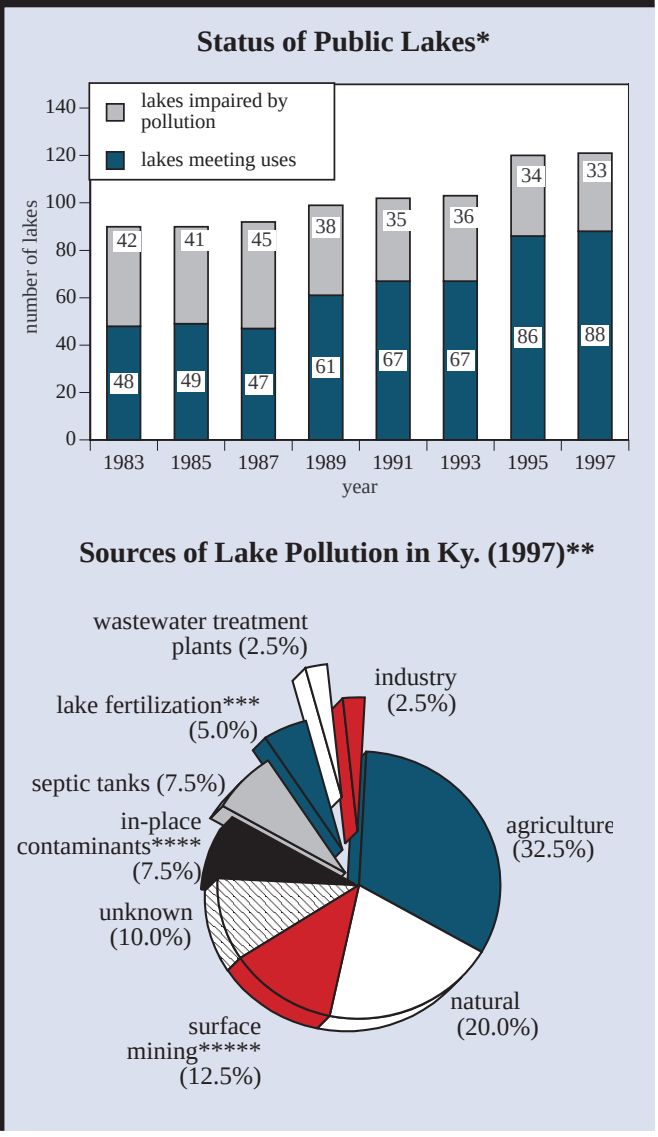
Background Thousands of lakes provide Kentuckians with recreational and economic benefits as well as supply several communities with primary and secondary sources of drinking water. The Kentucky Division of Water estimates there are 2,271 lakes in Kentucky, of which 953 are greater than ten acres in size. The Division monitors most publicly owned lakes every five to seven years. Publicly owned lakes are owned or managed by a city, county, state, or federal agency.

Source Agriculture remains the leading source of lake pollution in Kentucky, accounting for about 32% of the pollution problems detected in monitored public lakes during 1997. Natural conditions, such as shallow lake basins, are impairing eight of the 33 lakes impacted by pollution, while coal mining accounts for 12.5% of the water quality problems of monitored public lakes.

Goal Safeguard from pollution the uncontaminated waters of the Commonwealth; prevent the creation of any new pollution of the waters of the Commonwealth; and abate any existing pollution per KRS 224.70-100.

Progress During the past 14 years, trends reveal a general improvement in the number of monitored public lakes meeting their designated uses for swimming, fishing, or as a drinking water source. But problems remain. One in four public lakes assessed during 1997 was impaired by pollution.

Figure 6 Public Lakes in Kentucky Impaired by Pollution



**Based on publicly owned lakes assessed. **Based on 33 public lakes assessed not meeting or partially meeting designated uses. Some lakes have multiple sources of pollution which are reflected in this chart. ***Adds additional nutrients to increase fish stocks. Excessive nutrients can cause a proliferation of weeds and affect aquatic and recreational uses. ****Chemicals (PCBs, metals) of unknown origin found in sediment. *****Active, inactive, abandoned coal mines. Source: Ky. Division of Water*

Figure 7 Most Polluted Public Lakes in Kentucky (1998)

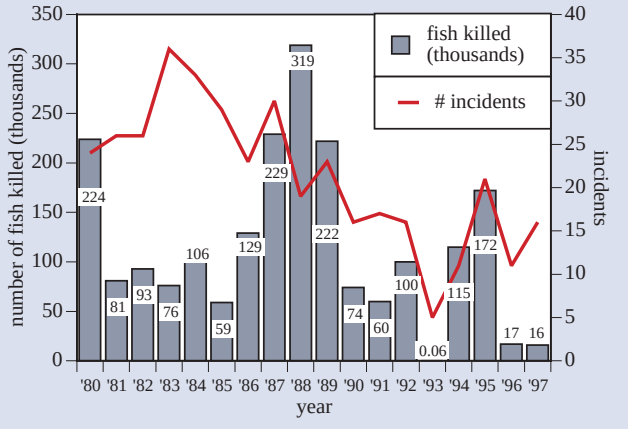
Lake/County	Listed	Cause	Source
Loch Mary/Hopkins	1980	metals, inorganics	acid mine drainage
Briggs/Logan	1983	nutrients	lake fertilization
Corbin/Laurel	1983	nutrients	wastewater, agriculture
Metcalfe/Metcalfe	1983	nutrients	agriculture
Reformatory/Oldham	1980	nutrients	livestock
Sympson/Nelson	1998	nutrients	livestock

Note: Monitored lakes not supporting designated uses.
Source: Ky. Division of Water

Indicator 3: Fish Kills and Fish Consumption Advisories

Background Kentucky's waterways provide habitat to numerous species of plants, animals, and fish. But pollution and ecosystem alterations, such as dams and the removal of vegetation alongside of waterways, have impacted populations of several species of aquatic life. For example, 40% of the state's 103 native mussels now are considered rare and 67 species of freshwater fish are considered at risk due to pollution and ecosystem alterations. In some cases, pollutants have contaminated fish tissue making it unsafe for human consumption.

Figure 8 Fish Kill Incidents in Kentucky



Source: Ky. Reports to Congress on Water Quality, Ky. Department of Fish and Wildlife Resources

Source In 1997, more than 1,900 of the 6,363 miles of waterways monitored for aquatic life could not support or only partially support healthy aquatic life populations.

Goal Ensure that the waters of the Commonwealth support healthy fish populations and assure that the fish are safe to eat.

Progress During the past 17 years, trends reveal a general decline in the number of fish kill incidents reported in the state. In 1997, 16 incidents killed 16,000 fish along 17.5 miles of streams. Sewage was the leading cause of fish kills followed by fuel spills.

Six fish consumption advisories remain in effect in Kentucky. PCBs (probable human carcinogens, according the the U.S. EPA and CDC) are the contaminant of concern in five of the six advisories. Chlordane is also of concern in the Ohio River advisory, and mercury is responsible for the sixth advisory.

Figure 9 Fish Consumption Advisories in Effect in Kentucky

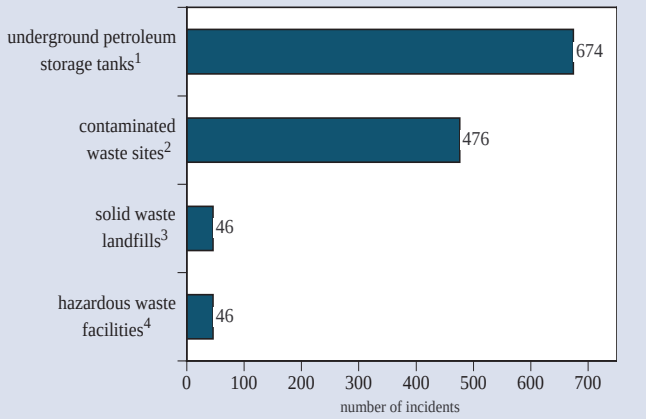
Stream	pollutant	year listed	miles	source	fish
Town Br./Mud Rvr. (Logan,Butler,Muhlenberg)	PCBs	1985	71.5	dye-cast plant	all species
West Fork Drakes Creek (Simpson, Warren)	PCBs	1985	46.9	adhesive plant	all species
Little Bayou Creek (McCracken)	PCBs	1985	6.5	gaseous diffusion plant	all species
Ohio River* (entire length Ky. border)	PCBs chlordane	1989	663.9	industry urban runoff	**
W. Ky. Wildlife Area (McCracken)	mercury	1993	5 ponds	unknown	bass
Green River Lake (Taylor, Adair)	PCBs	1994	entire lake	gas compression station	catfish carp

**The Ohio River advisory based on Great Lakes Advisory Protocols. Other advisories based on U.S. FDA action level guidelines. **All paddlefish are unsafe to eat. Carp, channel catfish, smallmouth buffalo, white bass, white crappie, hybrid striped bass, drum, sauger, black bass, blue catfish are safe to eat in measured amounts. Source: Ky. Div. of Water*

Indicator 4: Groundwater Quality

Background Groundwater is a valuable resource in Kentucky. An estimated 618,323 million Kentuckians are served by 445 community and noncommunity public drinking water systems that rely on groundwater for supplies. During 1997, these systems were permitted to withdraw 60 million gallons a day to meet drinking water needs. Another half million Kentuckians depend on private groundwater wells for drinking water, according to Census data. In addition, millions of gallons of groundwater are withdrawn by businesses, industries, and farmers to meet their water supply needs. Goundwater also contributes significantly to surface water flow and quality. In dry periods, the flow of some streams may be supplied entirely by groundwater.

Figure 10 Groundwater Contamination Incidents in Ky.



[1]Cumulative number of tanks with confirmed groundwater contamination. [2]Cumulative estimate based on CERCLA/Superfund sites investigated. [3]Based on active and closed landfills monitoring groundwater. [4] Hazardous waste treatment, storage, and disposal permitted and nonpermitted facilities.
Source: Ky. Division of Waste Management

Source Groundwater contamination incidents have been reported in almost every county of the Commonwealth. There are numerous threats to groundwater resources including leaking underground storage tanks, waste sites, and improper land application and disposal of agricultural and lawn chemicals. Groundwater contamination is often difficult, and sometimes impossible, to clean up.

Goal Protect the waters of the Commonwealth.

Progress The Kentucky Division of Water established an ambient groundwater quality monitoring network in 1995 to enhance the knowledge of groundwater quality. Water samples are collected quarterly from 112 sites across the state and tested for nutrients, metals, inorganic chemicals, volatile organic chemicals, and pesticides (insecticides, fungicides, herbicides).

Figure 11 Ambient Groundwater Well Testing Program in Kentucky (Selected Parameters)

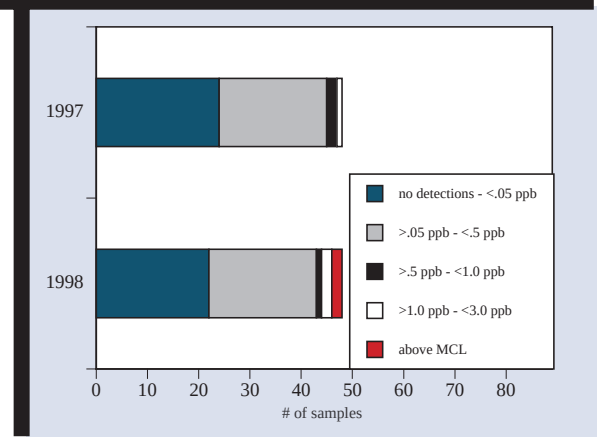
Parameter	springs/wells sampled	# of samples	% detects	% detects above standards*
Alachlor				
springs	71	605	4.3	0
wells	56	285	1.1	0
Atrazine				
springs	71	778	21.4	1.4
wells	56	424	2.8	0
Metolachlor				
springs	71	595	15.0	9.9
wells	56	285	0.4	0
Nitrate-N				
springs	48	205	99.0	0
wells	40	135	92.0	5.2
Arsenic				
springs	71	1,642	1.3	0
wells	56	982	14.0	3.5
Simazine				
springs	71	734	5.0	0
wells	56	413	0	0
Fluoride				
springs	71	329	99.0	0
wells	56	191	99.0	0

*Note: Based on tests conducted between 1995-1998. *Detections above Maximum Contaminant Level or Health Advisory Limit.*
Source: Ky. Division of Water

Preliminary data for selected parameters from the ambient groundwater monitoring network reveal varying levels of pesticides and other pollutants in water samples. For example, atrazine, a common agricultural herbicide used in corn production, was detected in 21% of the spring samples, and arsenic was found in 14% of the well samples. Most detections of these and other agricultural chemicals were in the Pennyroyal region of the state. Several samples exceeded safe drinking water or health advisory standards.

Figure 12

Atrazine Testing in Selected Springs and Wells in Kentucky



Based on samples from 13 well and spring sites in 1997 and 14 well and spring sites in 1998. Source: Ky. Division of Pesticides

During the 1997 and 1998 growing seasons, the Kentucky Division of Pesticides also contracted with the Division of Water to monitor 14 sites in Woodford, Fayette, Hardin, Daviess, Warren, Christian, Logan, and Todd counties for pesticide contamination. In 1997, eight karst springs and five private wells were monitored, generating 48 samples. In 1998, nine karst springs and five private wells were tested generating 49 samples. The results of the two-year survey indicate that both wells and springs showed detections of pesticide contamination; however, karst springs yielded the highest levels of pesticide contamination. The survey found that karst springs are particularly vulnerable to contamination from agricultural pesticides (atrazine, simazine, metolachlor, and acetochlor). Two karst spring samples taken from Logan County's Mud Spring in 1998 found levels more than twice the drinking water standard for atrazine.

A recently published study of nitrate/nitrogen contamination by the Kentucky Interagency Ground-Water Monitoring Network found 9.7% of the 391 hand-dug wells tested had nitrate levels above Maximum Contaminant Levels (MCL) while 3.7% of the 2,903 constructed wells (depth 51 ft. to 500 ft.) sampled had unsafe levels of nitrate/nitrogen contamination. The study also sampled 1,108 springs in Kentucky and found 3% had nitrate/nitrogen levels above the MCL.

These studies show that varying levels of pesticides and nitrates have impaired the quality of groundwater in Kentucky. However, much more data and analysis are needed in order to assess trends determine the overall condition of Kentucky's groundwater resources.

Several measures have been undertaken to protect groundwater resources in Kentucky. These include a 1994 state regulation requiring facilities that have the potential to pollute groundwater to develop and implement groundwater protection plans by August 1995. To date, 161 site specific and eight generic plans have been reviewed by the Kentucky Division of Water and 85 plans have been approved. The state Agriculture Water Quality Act of 1994 also requires all farm and silviculture operations to prepare water quality plans by October 2001 to protect surface and groundwater. The Kentucky Division of Conservation reports that 970 plans in 64 counties have been prepared to date.

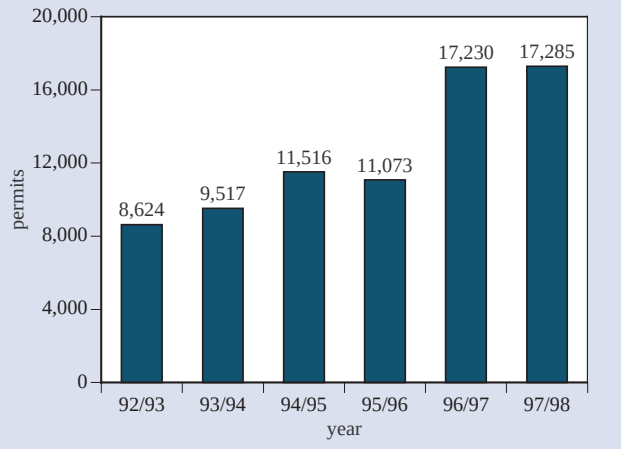
Indicator 5: On-Site Sewage Disposal

Background While most of the focus of the Clean Water Act has been on controlling pollution from large municipal and industrial sources, failing septic systems and illegal straight pipe discharges of sewage from homes and businesses are contributing to pollution problems in a number of Kentucky waterways.

Source Forty-four percent of the state's households rely on septic tanks and other on-site systems for sewage treatment, according to 1990 U.S. Census data. It is not known how many failing septic systems and illegal straight pipes are discharging raw sewage into waterways, but it is considered a widespread problem across the state.

Figure 13

On-Site Sewage Disposal Permits Issued in Kentucky



Note: Based on state fiscal year. Data on septic tank permits prior to 1992-93 not available. Source: Ky. Dept. for Public Health

Goal Protect the waters of the Commonwealth through the proper construction, installation, and alteration of on-site sewage disposal systems (KRS 211.350).

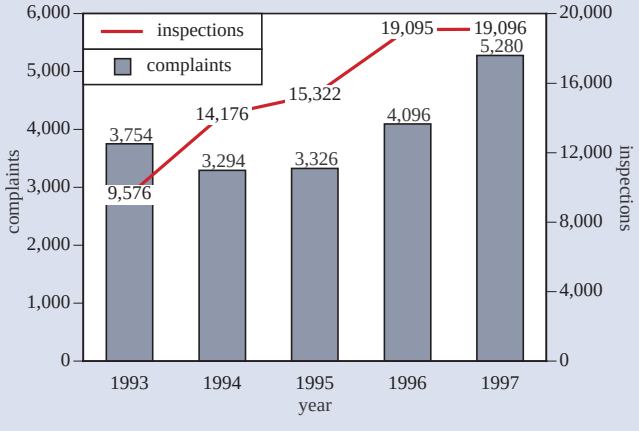
Progress Each year, thousands of on-site septic system permits are issued by local health departments. However, the Kentucky Department for Public Health reports that an estimated 5,000 homes are built each year with illegal straight pipe sewage discharges or inadequate septic systems. Kentucky began to focus more attention on this problem during the past few years and some progress has been made. Senate Bill 18 was passed by the 1998 General Assembly to prohibit the connection of electricity to a new residence unless the owner has an approved plan to install adequate sewage-disposal facilities. The effect of this legislation is already being realized with a 400% increase in on-site sewage permits in Pike County alone. The Department for Public Health expects a statewide rise in on-site sewage permits of 40% to 50% in response to the law.

In 1998, a $4 million grant from the U.S. Department of Commerce was awarded to a 40-county area along the Kentucky River to address existing septic tank problems. The grant will establish a revolving loan fund to provide low-interest loans to homeowners who have straight pipe sewer lines or failing septic tanks. The funds are expected to assist 35 to 50 households per county resolve on-site sewage problems.

State legislation was also passed in 1998 to address discharges of untreated sewage from houseboats. It is estimated that half of the 4,000 houseboats on Kentucky's waters are discharging untreated sewage to waterways, according to the bill's sponsor, state Representative Steve Nunn. The bill will require all houseboats with marine toilets to have sanitation devices to treat or store wastewater and all marinas to have sewage pumpout stations by July 15, 2000.

Figure 14

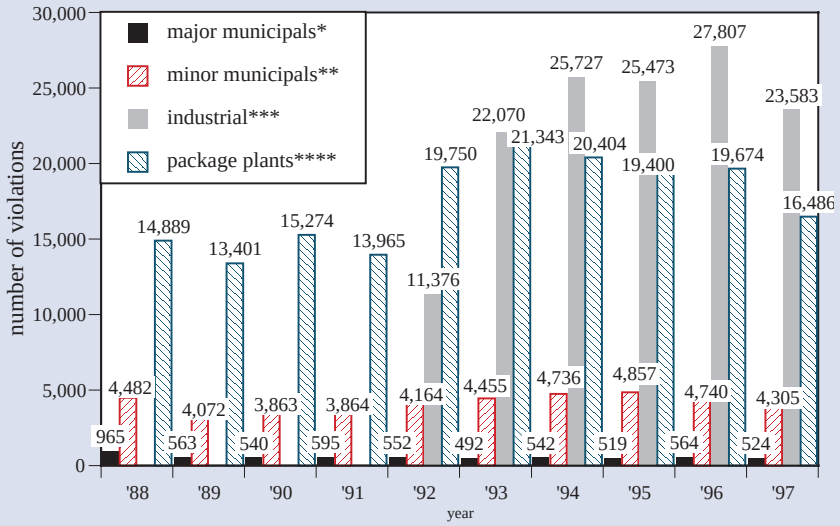
On-Site Sewage Disposal Inspection and Complaint Trends in Kentucky



Source: Ky. Department for Public Health

Indicator 6: Wastewater Treatment Facilities

Figure 15 **Violation Trends at Wastewater Treatment Facilities in Kentucky**



Note: Industrial and municipal facilities generally monitor for a wider range of contaminants than package plants.

Major municipals treat 1,000,000 gallons or more per day. ** Minor municipals treat less than 1,000,000 gallons per day. * Industrial facilities treat effluent generated during manufacturing process (data not available prior to 1992). ****Package treatment plants are prefabricated plants of small capacity. Source: Ky. Division of Water*

BACKGROUND In 1997, wastewater treatment plants were the third leading source of pollution to monitored waterways. The environmental and health implications from the poor operation of these plants can be severe, impairing water quality with disease-causing bacteria and nutrient-laden effluent. In addition to degrading surface water, sewage can migrate into groundwater through the limestone karst underlying almost half of Kentucky.

SOURCE In 1997, 3,089 wastewater treatment facilities were permitted to operate in Kentucky. They include 1,326 industrial, 243 municipal, and 1,520 package treatment plants.

GOAL Protect the waters of the Commonwealth by ensuring compliance with state and federal water rules, regulations, permits, and orders.

PROGRESS Although water quality improvements have been achieved through the construction and upgrading of wastewater treatment plants, the poor operation of a number of plants are polluting several waterways with pathogens, nutrients, and metals. During 1997, 66% of the 3,089 permitted wastewater plants had one or more violations of water quality regulations. While 70% of the 45,373 violations cited were either monitoring or reporting infractions, 30% (13,633 violations) were violations of permit limits established to protect public health and the environment.

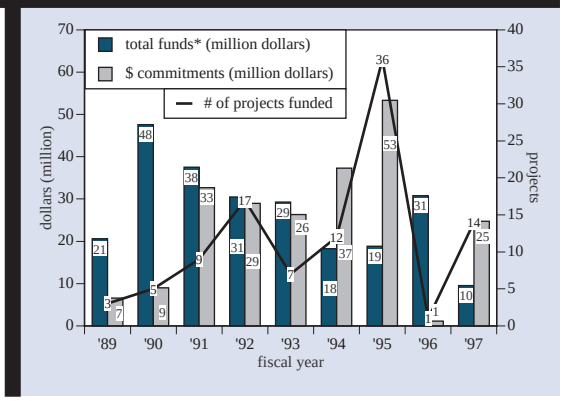
Package treatment plants account for 45% of the wastewater permit limit violations in the state. Poor mainte-

Figure 16 **Types of Wastewater Treatment Plants and Violations of Regulatory Requirements (1997)**

type of plant	number of plants	# of plants in violation	% plants in violation	total violations*	violations of permit limits
Major Municipal	67	55	82%	524	517
Minor Municipal	176	143	81%	4,305	2,169
Major Industrial	60	49	82%	475	466
Minor Industrial	1,266	831	67%	23,583	4,382
Package	1,520	970	64%	16,486	6,099
Total	**3,089**	**2,048**	**66%**	**45,373**	**13,633**

**Includes permit, monitoring, reporting violations. Source: Ky. Division of Water*

Figure 17 **Kentucky Wastewater Revolving Loan Fund**



** Includes federal grants, state match, and interest incurred.*
Source: Ky. Division of Water

Figure 18 **Pretreatment Programs in Significant Noncompliance (1997)**

wastewater treatment plant	# industrial users	# in non-compliance
Ashland	7	1
Bardstown	16	2
Berea	8	1
Bowling Green	25	2
Campbell/Kenton Co.	49	1
Campbellsville	6	1
Carrollton	7	4
Corbin	9	1
Danville	7	1
Elizabethtown	19	2
Elkton	1	1
Frankfort	15	2
Franklin	10	1
Fulton	5	4
Georgetown	7	4
Glasgow	14	6
Lawrenceburg	5	1
Lebanon	6	2
Leitchfield	11	3
Lexington	34	6
London	9	3
Louisville	121	12
Madisonville	7	3
Mayfield	5	5
Maysville	7	1
Morehead	6	1
Mount Sterling	7	6
Murray	4	1
Nicholasville	6	1
Owensboro	21	1
Paris	8	5
Princeton	2	1
Richmond	23	1
Russellville	6	1
Shelbyville	15	2
Somerset	27	2
Stanford	2	2
Williamsburg	3	1
Williamstown	3	1
Total (1997*) **39**	**543**	**96**
Total (1996*) **21**	**340**	**56**
Total (1994*) **19**	**339**	**52**
Total (1992*) **27**	**413**	**115**

**July-December reporting period. Source: Ky. Div. of Water*

nance and operation at a number of facilities have led the state to target problem plants for removal or regionalization. Since 1995, 186 package plants have been deactivated.

Efforts to upgrade and build new municipal wastewater treatment plants continue. Millions of dollars in federal, state, local, and private funds have been invested in wastewater treatment. For example, since 1989, 104 projects totaling $220 million have been funded through a low-interest state wastewater revolving loan program. The Louisville Jefferson County Metropolitan Sewer District (MSD) alone will spend $100 million over the next five years on plant improvements to be financed by local bonds. But an estimated $3.2 billion is still needed over the next 20 years to meet statewide wastewater construction needs.

The state is also working to prevent the discharge of pollutants to waterways through the use of pretreatment programs. Pretreatment programs are in effect at 662 industrial facilities in 65 cities. This program requires the pretreatment of industrial wastewater prior to its discharge to a municipal wastewater treatment plant. During 1997, 96 of the 662 industries (14.5%) regulated by pretreatment programs were in significant noncompliance. This is an increase since 1996 when 56 industries were in violation. The increase is attributed to the addition of Kentucky Division of Water staff to review pretreatment programs and the increasing use of computer databases by municipalities to review their performance.

Sewer overflows into waterways are a concern as well. Combined sewer overflows (CSOs) are a problem in older cities where stormwater runoff is carried in sanitary sewer pipes. During storms, the sewers overflow and discharge raw sewage into receiving waters. The Kentucky Division of Water has identified 17 cities with 306 CSO outfall points. Louisville has the greatest number of CSOs at 118. MSD estimates that it will cost up to $200 million to address CSOs (ten times what the agency spends each year on new wastewater construction).

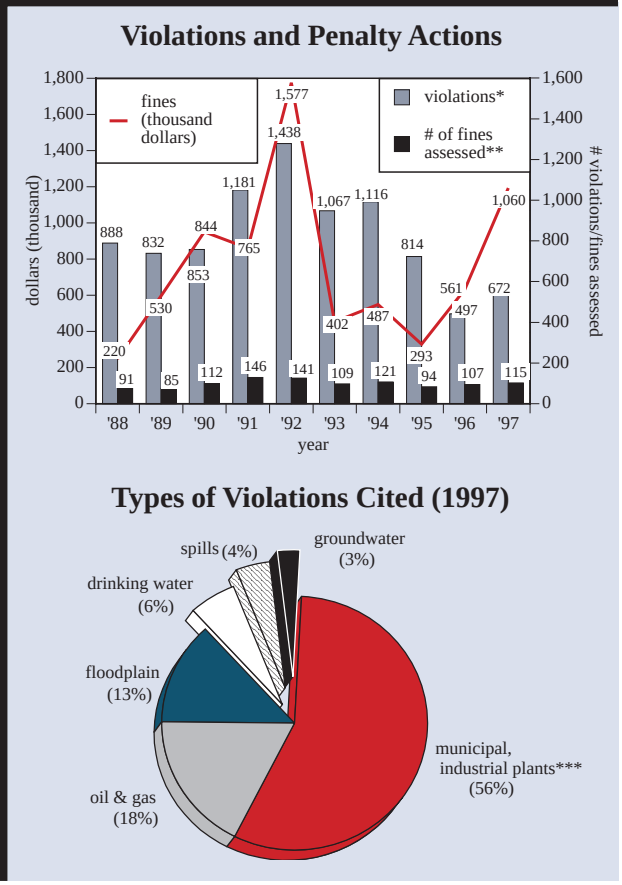
Indicator 7: Enforcement

Background State efforts to restore water quality have primarily emphasized the control of industrial and municipal discharges into waterways. Under the federal Clean Water Act of 1972 and state law, the discharge of pollutants into the waters of the Commonwealth is prohibited unless a Kentucky Pollutant Discharge Elimination System (KPDES) permit is issued. These permits limit the amount of pollutants discharged, require monitoring, and must be renewed every five years.

Source There are many activites that have the potential to pollute water which are subject to state water quality regulations. These include the 2,151 individual KPDES industrial, coal mining, and municipal water discharge facility permits, oil and gas operations, agricultural operations, illegal dumps, straight pipe sewage discharges, and spills.

Goal Protect the waters of the Commonwealth by ensuring compliance with water rules, regulations, permits, and agreed orders.

Figure 19 Water Quality Violations/Penalty Trends



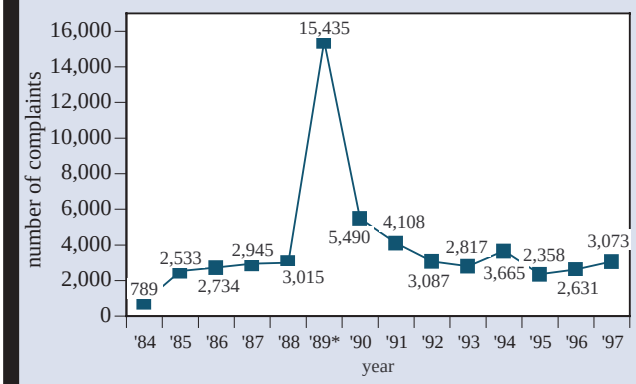
*Note: Does not include coal mining water violations and penalties. *Violations cited by field inspectors. **Penalties assessed by the Div. of Water, Enforcement Branch (does not include drinking water or federal government penalty assessments). ***Data not separated by individual sources (municipal or industrial facilities).*
Source: Ky. Division of Water

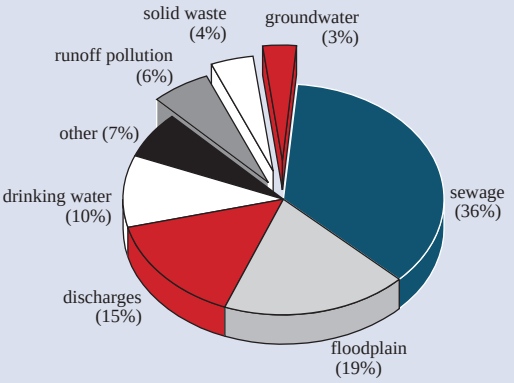
Progress Many water quality improvements are a result of enforcement of Clean Water Act rules. Water inspections hit an all-time high in 1993, totaling 13,490. Total inspections has since steadily declined and numbered 8,731 in 1997. Total violations cited has declined as well, dropping 53% between 1992 and 1997. The decline of inspections in 1997 is attributed to the floods of March 1997 and 452 open dump inspections conducted by Kentucky Division of Water inspectors which are not reflected in Figure 19. In 1997, Kentucky Division of Water field inspectors worked 2,517 hours addressing flood-related issues.

Industrial and municipal facilities were the greatest violators of clean water rules, accounting for 56% of the 672 violations cited in 1997 by field inspectors. In additon, the Kentucky Division of Water's KPDES Branch reports that for the quarter July-September 1998, 58.7% of the 2,151 KPDES facility permits were in significant noncompliance (SNC) for failure to report required monitoring results while 2.2% were in SNC for effluent discharges above permitted limits. Though the number of facilities in SNC for reporting violations is high, most submit their monitoring reports within a reasonable amount of time, according to state officials.

Many violations issued in the field are in response

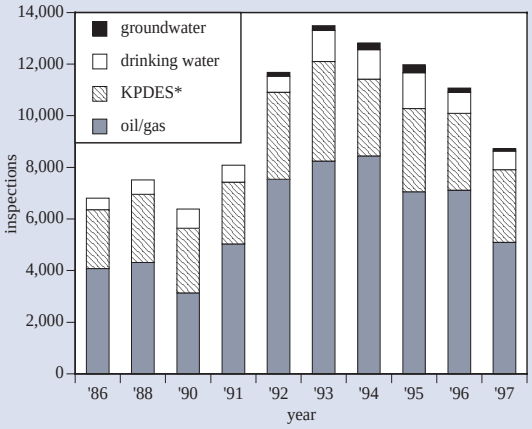
Figure 20 Citizen Water Complaints in Kentucky





*Note: Complaints received by the Division of Water. *Increase in complaints attributed to Russell County proposed sewage treatment plant pipeline to Lake Cumberland.*
Source: Ky. Division of Water

Figure 21 Ky. Water Quality Inspection Trends



*Note: *Facilities with Ky. Pollution Discharge Elimination System permits. Does not include inspections at KPDES permitted coal mines which are conducted by the Ky. Dept. of Surface Mining. Does not include complaint inspections.*
Source: Ky. Division of Water

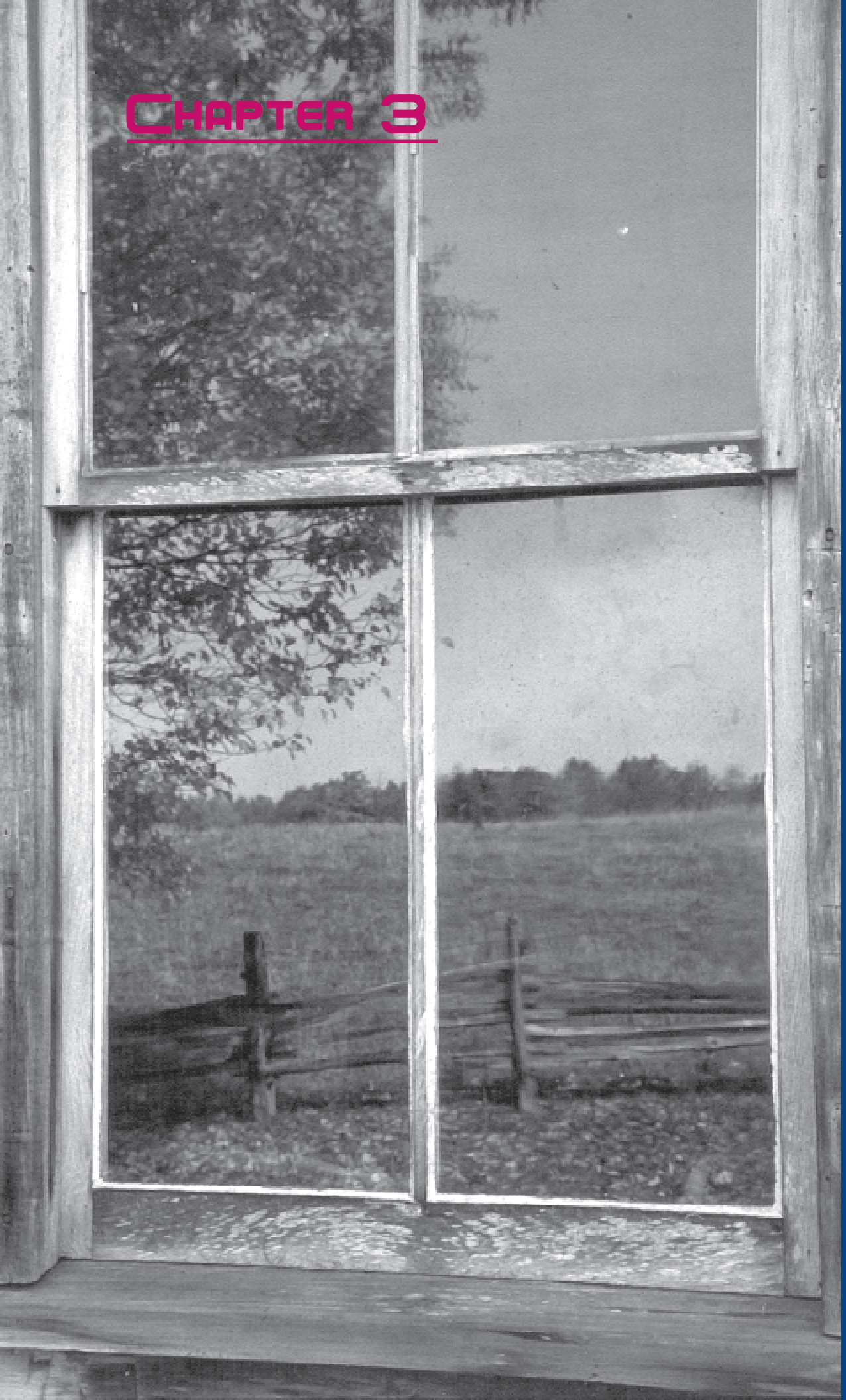
Figure 22 Major KPDES Facilities in Significant Noncompliance*

Facility	County
BTR Precision Die Casting	Logan
Henderson STP #2	Henderson
Hopkinsville Hammond Wood STP	Christian
Am. Electric Power Big Sandy Plant	Lawrence
McCracken Co. SD#3 (Reidland)	McCracken
Paris STP	Bourbon
Russellville STP	Logan
US Army Armour Ctr. & Fort Knox	Hardin
Westlake CA & O Corp.	Marshall
Worldsource Coil Coatings	Hancock

*Note: STP - sewage treatment plant. Significant noncompliance is defined as those facilities with two to four exceedances of permit limits in a six month period based on type of pollutant. Major facilities currently include 69 major municipal wastewater treatment plants that treat one million gallons or more per day, 68 industrial, and four federal facilities based on chemical and conventional pollutants, flow, and potential to impact health and water quality. *As of Nov. 1998. Source: Ky. Division of Water*

to citizen complaints. More than half of the 3,073 complaints received by the Kentucky Division of Water in 1997 concerned sewage or improper discharges to waterways.

Most violations are resolved through agreed orders or other means; however, some of the more serious infractions result in fines. During 1997, $1.06 million in penalties was assessed against 115 entities, 49 of which were permitted facilities. The fines assessed in 1997 were the second largest on record since EQC began tracking penalties in 1989. The increase is attributed to large penalties assessed against DuPont ($62,500), the Greater Cincinnati/Northern Kentucky Airport ($100,000), and the two Circuit Court judgements from cases that originated in 1991 ($70,000) and 1992 ($150,000). The fine against the Greater Cincinnati/Northern Kentucky Airport was resolved through the use of a Supplemental Environmental Project (SEP). The airport agreed to pay $50,000 of the fine and purchase a $250,000 machine to sweep the airport tarmac for excess airplane deicing fluid that was running into nearby streams.



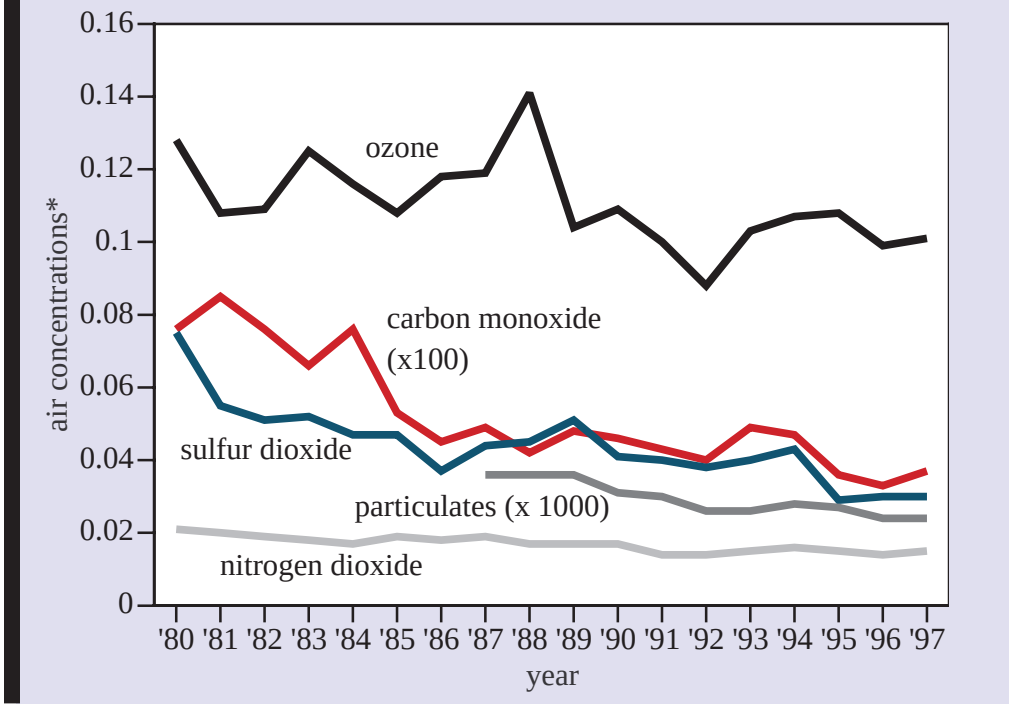
Chapter 3

Air Quality

Indicator 1: Ambient Air Concentrations

Figure 1

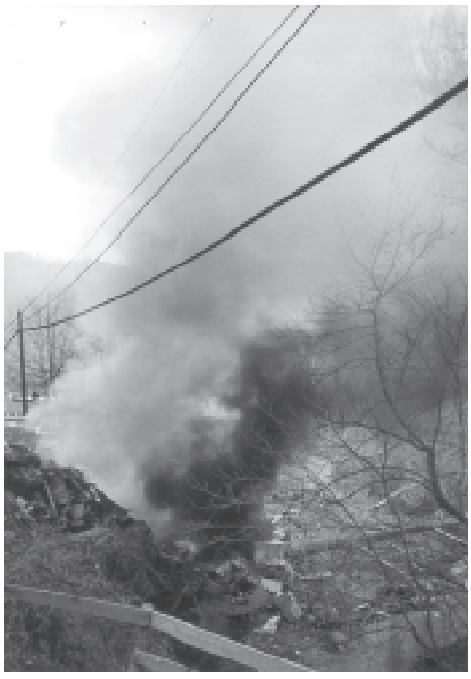
Air Concentrations of Criteria Pollutants in Kentucky



**Concentrations from state monitored sites based on the following: ozone: averaged second maximum, one-hour standard. CO: second maximum eight-hour average. NO_x and particulates (PM_{10}): annual statewide averages. SO_2: second maximum, 24-hour average. Concentrations in parts per million for all pollutants except particulates, which are measured in micrograms per cubic meter. Source: Ky. Div. for Air Quality*

Background The federal Clean Air Act (CAA) of 1970, along with modifications in 1977 and amendments in 1990, has significantly improved the quality of air Kentuckians breathe. The CAA specifies controls for six criteria pollutants: ozone, nitrogen oxide, carbon monoxide, sulfur dioxide, particulates and lead. These pollutants can cause serious threats to human health and ecosystems and consequently have been the primary focus of federal and state air pollution programs.

The Kentucky Division for Air Quality operates a network of 98 monitoring stations in 34 counties. The Jefferson County Air Pollution Control District operates an additional network of 27 monitors. These stations provide data used to evaluate compliance with ambient air quality standards. EQC also uses this information to track yearly average concentrations of air pollutants in Kentucky and assess trends.



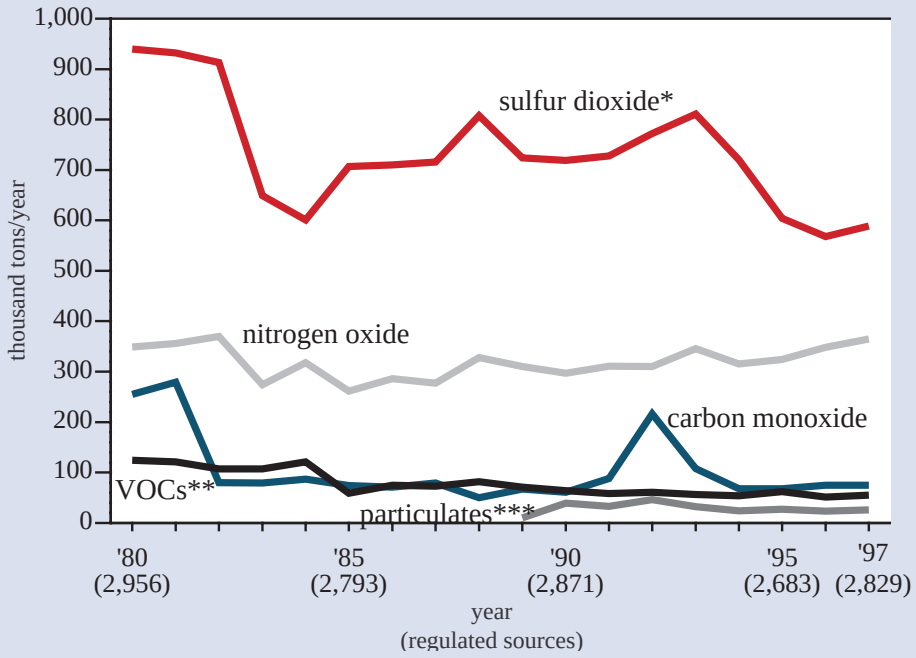
Source There are numerous sources of air pollution including point (i.e. smokestack), mobile (i.e. automobile exhaust), and area sources (i.e. dust from roads) in Kentucky.

Goal Ensure ambient air is safe to breathe.

Progress Since 1980, Kentucky, as well as the nation, has witnessed significant improvements in air quality. Pollution controls on industrial sources and automobiles have resulted in a statewide trend of declining average air concentrations of criteria pollutants. However, trends reveal that these reductions have leveled off in recent years.

Indicator 2: Industrial Air Emissions

Figure 2 **Air Emissions from Regulated Sources in Kentucky**



*Note: Excludes Jefferson County data because the Air Pollution Control District was unable to provide data for years prior to 1990. * Decline in SO_2 emissions in 1983-84 may have been due to closure of TVA power plant for repairs and installation of scrubbers. ** 1980-88 VOC data represent total hydrocarbons. *** PM_{10} data collection began in 1989. Source: Ky. Division for Air Quality*

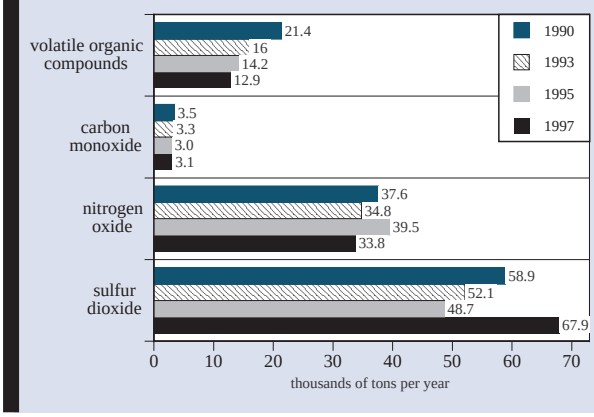
Background Reducing emissions of various pollutants consequently aids in reducing the concentrations of these pollutants in the air. This indicator tracks industrial emissions of criteria pollutants.

Source The Kentucky Division for Air Quality (DAQ) and the Jefferson County Air Pollution Control District (JCAPCD) regulate point, mobile, and area sources of air pollution in the state. DAQ regulates 1,878 permitted, 310 registered and 641 other sources of air pollution. JCAPCD regulates 790 permitted and 536 registered sources. Nearly 290 facilities are major sources, emitting 100 tons or more of air pollutants each year.

Goal Limit emissions of air pollutants to levels that meet air quality standards and prevent unacceptable risks to human health or the environment.

Progress Environmental controls have reduced emissions released by regulated sources resulting in lower ambient air concentrations of many of the criteria air pollutants. For example, statewide air emissions (excluding Jefferson County where 1980 data is not available) of sulfur dioxide fell from 940,000 tons in 1980 to 589,000 tons in 1997, carbon monoxide emissions declined from 255,000 tons in 1980 to 75,000 tons in 1997, and volatile organic compounds dropped from 124,000 tons in 1980 to 55,000 tons in 1997. The decline in industrial emissions has since leveled off in recent years.

Figure 3 **Industrial Emissions of Air Pollutants from Regulated Sources in Jefferson Co.**

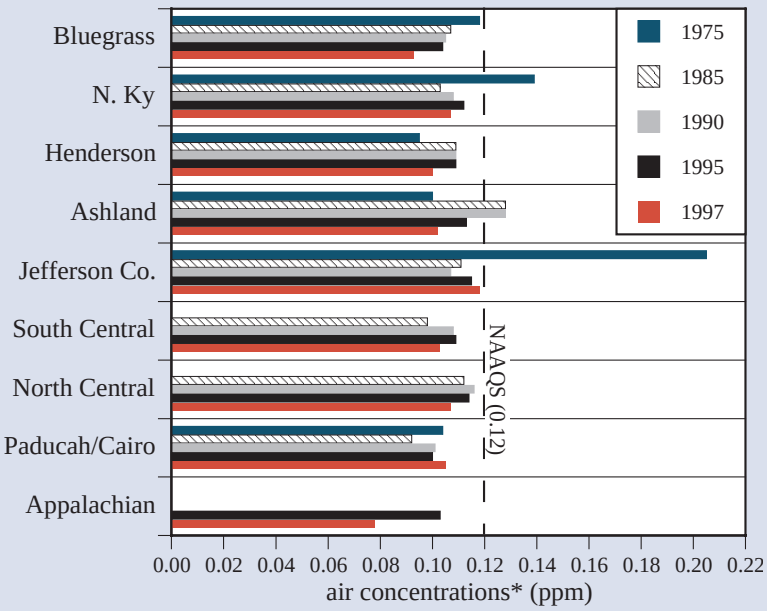


Note: Earlier data not available. Source: Jefferson County Air Pollution Control District

Indicator 3: Ground-Level Ozone

Figure 4

Regional Air Concentrations of Ozone



*Note: Selected years. Some regions were not monitored for all years. *Ozone air concentrations based on averaged second maximum, one-hour standard recorded at state-monitored sites within each region. Concentrations compared to the National Ambient Air Quality Standard (NAAQS). ppm-parts per million.*
Source: Ky. Division for Air Quality

Background Although ozone acts as a protective layer high above the earth, ground-level ozone, a main ingredient in smog, can be harmful to human health. Breathing ground-level ozone, above the health-based standards, is known to cause chest pain, coughing, and may worsen bronchitis, heart disease, emphysema, and asthma. Healthy people can also experience breathing problems when exposed to high levels of ozone. Currently, 771,875 Kentuckians, or 19.8% of the population, live in areas not meeting the one-hour 0.12 ppm ozone standard. Significantly more Kentuckians are living in areas that will likely fail to meet a new federal eight-hour 0.08 ppm ozone standard. The Kentucky Division for Air Quality is currently monitoring air quality across the state to determine compliance with the new standard.

Source Ground-level ozone is formed when volatile organic compounds (VOCs) such as chemical solvents, gasoline vapors, and oxides of nitrogen (NO_x), a by-product of combustion, react with sunlight. High ozone levels are most prevalent during the summer months when the air is hot and stagnant. Winds can also transport ozone and ozone precursors to downwind areas, exacerbating ground-level ozone. During 1997, area sources emitted 147,697 tons, onroad mobile emitted 93,502 tons, nonroad mobile emitted 37,653 tons, and regulated point sources emitted 67,900 tons of VOCs. Air Products and Chemicals in Marshall County led the state with 9% (6,181 tons) of the statewide regulated VOC emissions followed by Toyota Motors Manufacturing (3,264 tons), and ISP Chemicals (2,080 tons).

Goal Implement and enforce requirements to meet the ozone standard (0.12 parts per million averaged over one hour) as required by federal and state law. Adopt new measures designed to reduce regional transport of ozone and achieve the new ozone standard (0.08 parts per million averaged over eight hours) by 2007.

Progress Kentucky was among 30 states and the District of Columbia that violated the national one-hour ozone pollution standard between 1995-1997. The greatest number of ozone standard exceedances in Kentucky occurred during the hot summers of 1980, 1983, and 1988. Technologies to control VOC emissions, such as catalytic converters on automobiles, have led to a decrease in the number and severity of ozone standard

Figure 5

Number of Days with One or More Ozone Standard Exceedances, by Air Quality Control Region

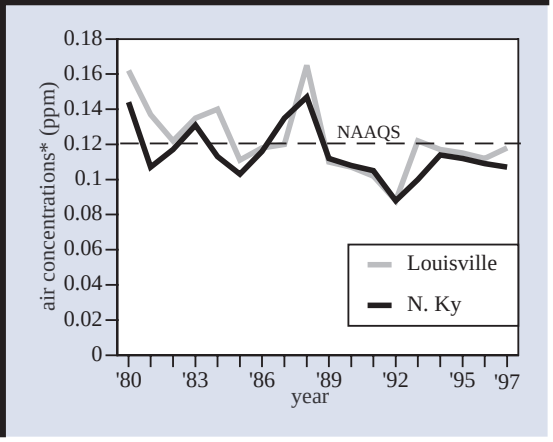
	Bluegrass	N. Ky.	Henderson	Ashland	Jefferson	Paducah	N. Central	S. Central	Appalachian
1980	0	10	1	4	23	1	1	0	NM
1981	1	0	2	0	5	1	0	0	0
1982	0	1	0	3	4	0	0	0	0
1983	2	7	4	8	19	2	3	0	0
1984	0	1	0	7	11	0	0	0	NM
1985	0	1	1	3	1	0	0	0	NM
1986	3	1	2	3	2	2	3	0	NM
1987	2	3	2	8	6	0	2	1	NM
1988	5	15	12	12	7	5	12	5	NM
1989	0	1	0	1	4	0	0	0	NM
1990	1	0	3	4	1	0	2	0	NM
1991	0	0	0	3	0	0	2	0	NM
1992	0	0	0	0	0	0	0	0	0
1993	0	1	0	1	2	1	1	0	0
1994	0	0	2	2	1	0	0	0	0
1995	0	1	0	1	2	0	1	0	2
1996	0	1	0	0	2	0	0	0	0
1997	0	0	0	1	1	0	3	0	0

Note: Based on number of days in Kentucky that had one or more exceedances of one-hour ozone standard as recorded at state air quality monitors. NM-not monitored. Source: Ky. Division for Air Quality

exceedances in Kentucky. Most regions of the state have met the 0.12 parts per million (ppm) one-hour ozone standard, and the U.S. EPA has declared that this standard no longer applies to these areas. The Louisville ozone nonattainment area (Jefferson and portions of Bullitt and Oldham counties and the southern Indiana counties of Floyd and Clark), however, has not yet achieved that standard and therefore remains subject to it.

Figure 6

Louisville and Northern Kentucky Ozone Air Concentrations



**Ozone concentrations based on averaged second maximum, one-hour standard recorded at state-monitored sites. ppm-parts per million. Source: Ky. Div. for Air Quality*

Although exceedances of the one-hour 0.12 ppm ozone standard have been declining in the Kentucky portion of the ozone nonattainment area, the region is still in violation and measures must be taken to address the problem. Ozone control measures in effect in the Louisville area include vehicle emissions testing, reformulated gasoline, and pollution controls on all major and many minor industrial and commercial sources. In 1997, the Jefferson County Vehicle Emissions Testing (VET) Program inspected 443,045 vehicles. Of that total, 35,040 vehicles were retested after initially failing the test and 7,050 vehicles ultimately failed the test. The county granted 606 waivers to vehicles that did not pass the test. In April 1998, a tougher VET program went into effect with the goal of reducing vehicle emissions another 2 million pounds per year.

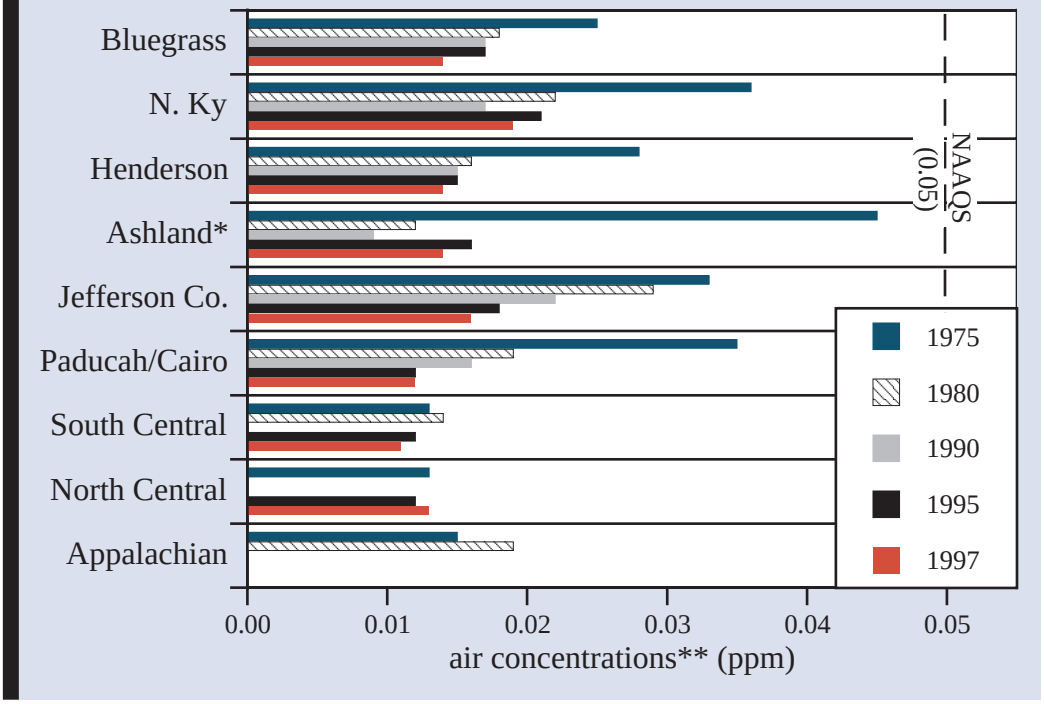
Recently, the U.S. EPA determined that air quality standards for ozone were not sufficient to protect human health. The agency reduced the concentration of ozone allowed in the air from 0.12 ppm to 0.08 ppm. The new standard is averaged over eight hours rather than one hour used by the existing standard. It is estimated that 16 counties in Kentucky will have difficulty meeting the new ozone standard, based on historical monitoring data.

In response to the Clean Air Act and the new ozone standard, Boone, Kenton, and Campbell counties will begin a Vehicle Emissions Testing Program in late 1999 to help reduce ozone concentrations. Approximately 236,000 vehicles will be tested every two years.

Indicator 4: Nitrogen Dioxide

Figure 7

Regional Air Concentrations of Nitrogen Dioxide



*Note: Selected years. Some regions not monitored for all years. * There is no explanation for the 1990 increase in the air concentration average in the Ashland region. This may be due to monitoring changes in the region that year. ** Yearly average NO_x concentrations at state-monitored sites. Concentrations compared to the National Ambient Air Quality Standard (NAAQS). ppm-parts per million. Source: Ky. Division for Air Quality*

BACKGROUND National ambient air quality standards limiting the amount of nitrogen dioxide in the air were established because high concentrations are known to impair human health. Nitrogen oxides also combine with water to form acids and contribute to the formation of acid rain and ground-level ozone.

SOURCE Nitrogen dioxide (NO_2) belongs to a family of highly reactive gases called nitrogen oxides (NO_x)—a brownish mixture produced by fossil fuel combustion from sources such as cars and power plants. During 1997, area sources emitted 74,728 tons, onroad mobile 135,793 tons, nonroad mobile 81,420 tons, and regulated point sources emitted 398,800 tons of NO_x. That year, power plants accounted for 84% of the regulated NO_x emissions. The TVA-Paradise power plant in Muhlenberg County led the state with 32% (128,418 tons) of the statewide NO_x regulated emissions followed by TVA-Shawnee power plant (34,617 tons), and Kentucky Utilities-Ghent power plant (28,540 tons).

GOAL Implement and enforce requirements to meet the national standard of 0.05 ppm for nitrogen dioxide, the 1990 Clean Air Act Amendments which specify large NO_x sources, such as power plants, modify combustion processes to reduce NO_x emissions 30% to 40% below 1980 levels by the year 2000 as part of the Acid Deposition Control Program, and NO_x emission limits that were also imposed by the U.S. EPA in 1998 to help reduce ozone pollution.

PROGRESS Air concentrations in all regions of the state remain below the national standard for NO_2.While several individual power plants

Figure 8

Nitrogen Oxide Emissions from Power Plants in Kentucky

County	Facility	1980 tons	1990 tons	1997 tons	1980-97 % change
McCracken	TVA - Shawnee	32,065	25,349	34,612	+7.9%
Muhlenberg	Ky. Utilities - Green	2,873	4,162	1,986	-30.9%
Muhlenberg	TVA - Paradise	127,451	97,787	128,418	+0.8%
Ohio	W. Ky. Energy - Wilson	N/A	6,355	6,367	+0.2%*
Daviess	OMU*	14,855	10,871	14,419	-2.9%
Hancock	W. Ky. Energy - Coleman	23,790	14,696	7,337	-69.2%
Henderson	Henderson Mun. Power	292	160	193	-34.3%
Webster	W. Ky. Energy - Reid	10,736	9,839	6,030	-43.8%
Webster	W. Ky. Energy - Green	5,940	8,292	6,837	+15.1%
Boone	Cinergy - East Bend	N/A	11,442	7,998	-30.1%*
Carroll	Ky. Utilities - Ghent	20,226	22,980	28,540	+41.1%
Bell	Ky. Utilities - Pineville	216	204	241	+11.6%
Clark	E. Ky. Power - Dale	1,692	2,481	4,897	+189.4%
Clark	E. Ky. Power - Smith	N/A	N/A	21	N/A
Fayette	Ky. Utilities - Haefling	28	26	.6	-97.9%
Mercer	Ky. Utilities - Brown	12,046	11,319	7,130	-40.8%
Woodford	Ky. Utilities - Tyrone	449	518	477	+6.2%
Lawrence	Am. Elec. Power - Big Sandy	N/A	25,249	22,860	-9.5%*
Mason	E. Ky. Power - Spurlock	N/A	12,090	16,246	+34.4%*
Pulaski	E. Ky. Power - Cooper	3,177	6,594	7,382	+132.4%
Jefferson	LG&E - Mill Creek	16,391	19,475	19,475	+18.8%
Jefferson	LG&E - Cane Run	14,333	8,674	7,420	-48.2%
Trimble	LG&E - Trimble	N/A	2,166	7,650	+253.2%*
Total	**23**	**286,560**	**300,729**	**336,537**	**+17.4%**

*N/A - not operating. *1990-97 comparison. Comparison made between 1980-95.*
Source: Ky. Division for Air Quality, Jefferson County Air Pollution Control District, Utility Information Exchange

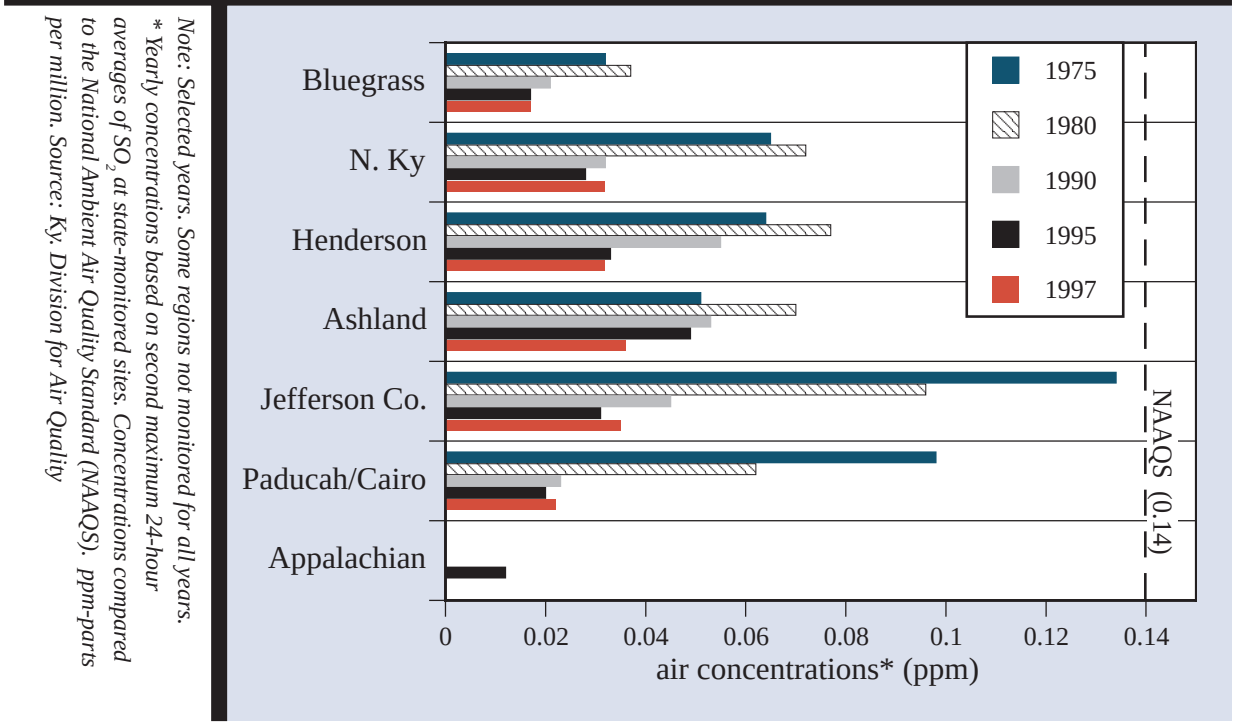
in Kentucky have reduced NO_x emissions, total statewide nitrogen oxide emissions released from power plants increased by 17.5% between 1980 and 1997.

Kentucky is one of 22 Midwestern states that must reduce the amount of NO_x emitted from coal-burning power plants and other sources under a new U.S. EPA rule. Nitrogen oxides, precursors to ground-level ozone, emitted from sources in the Midwest travel as far away as the Northeast, making it difficult for that region to meet federal ozone standards, according to the U.S. EPA. Kentucky and 21 other states will be affected by the new rule which is intended to reduce NO_x emissions by 1.1 million tons per year in the eastern U.S. by the year 2003. The new rule calls for reducing NO_x emissions from electric generating units in Kentucky by 66%. The plan also specifies reductions from other large industrial boilers of 60%, large cement kilns of 30%, and large stationary internal combustion engines of 90%. Kentucky will be responsible for emission cutbacks of 75,000 tons per ozone season (May through September).

Indicator 5: Sulfur Dioxide

Figure 9

Regional Air Concentrations of Sulfur Dioxide



Note: Selected years. Some regions not monitored for all years.
** Yearly concentrations based on second maximum 24-hour averages of SO_2 at state-monitored sites. Concentrations compared to the National Ambient Air Quality Standard (NAAQS). ppm-parts per million. Source: Ky. Division for Air Quality*

Background Sulfur dioxide is a pungent, colorless gas that can cause respiratory illness and aggravate existing cardiovascular disease. Certain populations are particularly sensitive to sulfur dioxide including children, the elderly, asthmatics, and individuals with chronic lung disease. Sulfur dioxide can also damage the foliage of trees and agricultural crops and is a major precursor to acid rain.

Source Sulfur dioxide (SO_2) is formed when fuel containing sulfur is burned. During 1997, stationary sources emitted 57,201 tons, onroad mobile 5,677 tons, nonroad mobile 26,056, and regulated point sources emitted 656,900 tons of SO_2. That year, coal-fired power plants accounted for 91% of the regulated SO_2 emissions. TVA-Paradise power plant led with 28% (187,099 tons) of the statewide regulated SO_2 emissions followed by American Electric Power-Big Sandy power plant (72,945 tons), and Kentucky Utilities-Ghent power plant (53,303 tons).

Goal Implement and enforce requirements to meet the national ambient air quality standard of 0.14 ppm for sulfur dioxide and the requirements of the 1990 Clean Air Act Amendments which specify a 40% reduction in SO_2 emissions by the year 2000, using 1980 as the baseline, as part of the Acid Deposition Control Program.

Progress Since the 1970s, the number of regions in Kentucky not attaining the SO_2 standard has dropped from seven to zero. The National Ambient Air Quality Standard for sulfur dioxide is being met throughout Kentucky, although the southern portion of Boyd County has not yet been redesignated as attainment.

Ongoing efforts by power plants to curb SO_2 emissions, as part of the 1990 national Acid Deposition Control Program, have likely contributed to the declining SO_2 air concentrations in some regions of the state. Total sulfur dioxide emissions from power plants in Kentucky fell 42.2% between 1980 and 1997 while the amount of coal burned at these plants increased 22.8% (from 31.1 million tons in 1980 to 38.2 million tons in 1997). Of the

Figure 10

Sulfur Dioxide Emissions from Power Plants in Kentucky

County	Facility	1976 tons	1980 tons	1997 tons	1980-97 % change
McCracken	TVA - Shawnee*	288,000	86,961	35,001	-59.8%
Muhlenberg	Ky. Utilities - Green River*	27,000	13,529	16,305	+20.5%
Muhlenberg	TVA-Paradise*	456,000	372,654	187,099	-49.8%
Ohio	W. Ky. Energy - Wilson*	N/A	N/A	7,961	N/A
Daviess	OMU*	74,000	45,159	7,687	-82.9%
Hancock	W. Ky. Energy - Coleman*	100,000	78,650	46,822	-40.5%
Henderson	Henderson Mun. Power*	9,000	1,526	1,271	-16.7%
Webster	W. Ky. Energy - Reid*	81,000	53,443	10,239	-80.8%
Webster	W. Ky. Energy - Green*	N/A	7,618	2,329	-69.4%
Boone	Cinergy - East Bend*	N/A	N/A	12,307	N/A
Carroll	Ky. Utilities - Ghent*	76,000	84,553	53,303	-36.9%
Bell	Ky. Utilities - Pineville*	1,000	467	539	+15.4%
Clark	E. Ky. Power - Dale*	8,000	3,929	7,639	+94.4%
Clark	E. Ky. Power - Smith	N/A	N/A	4	N/A
Fayette	Ky. Utilities - Haefling	5	5	<1	-99.4%
Mercer	Ky. Utilities - Brown*	57,000	53,153	32,544	-38.7%
Woodford	Ky. Utilities - Tyrone*	2,000	1,081	863	-20.2%
Lawrence	Am. Elec. Power Big Sandy*	60,000	61,617	72,945	+18.4%
Mason	E. Ky. Power - Spurlock*	NA	19,322	30,956	+60.2%
Pulaski	E. Ky. Power - Cooper*	35,000	12,743	15,629	+22.6%
Jefferson	LG&E - Mill Creek*	112,039	107,491	48,380	-55.0%
Jefferson	LG&E - Cane Run*	109,578	32,904	16,090	-51.1%
Trimble	LG&E - Trimble*	NA	NA	13,720	N/A
Total	**23**	**1,495,622**	**1,036,805**	**599,049**	**-42.2%**

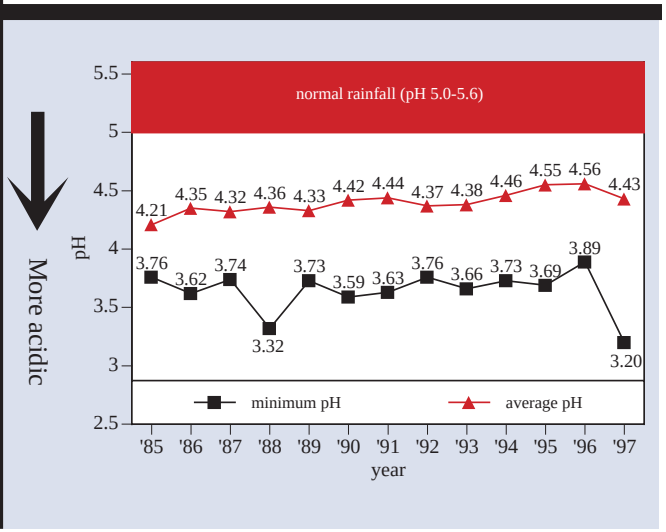
**Utilities affected under Phase II of the National Acid Rain Reduction Program. N/A-not operating. Source: Ky. Division for Air Quality, Jefferson County Air Pollution Control District, U.S. EPA, LG&E*

state's 23 power plants, 13 have reduced sulfur dioxide emissions between 1980-1997.

Several power plants have met the 40% reduction goal including TVA Shawnee, Owensboro Municipal Utilities, West Kentucky Reid and Green, East Ky. Power-Spurlock, Louisville Gas and Electric Mill Creek and Cane Run. Additional SO_2 reductions are slated for the year 2000 as part of Phase II of the national Acid Deposition Control Program.

Figure 11

Average pH of Rainfall at Monitored Sites in Kentucky



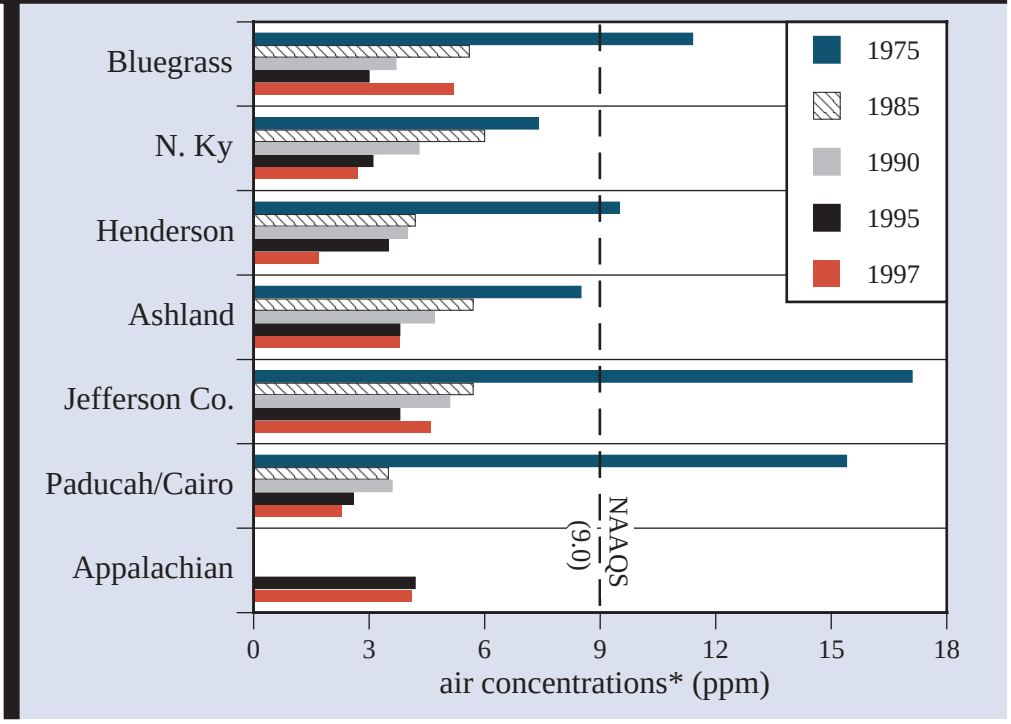
Note: Volume-weighted averages from monitored sites in Washington, Letcher, and Rowan counties. pH is a measure of acidity or alkalinity of a solution. Source: National Atmospheric Deposition Program, Illinois State Water Survey

Kentucky's rainfall has become less acidic over the years, possibly due to the reduction of sulfur dioxide emissions. Data from monitoring stations in three Eastern Kentucky counties reveal that the average pH of rainfall has become less acidic in the past 12 years. However, in 1997, rainfall pH was more acidic than in the previous year. The drop in pH in 1997 is attributed to meteorological events, such as low rainfall levels that year, according to officials at the National Atmospheric Deposition Program.

Indicator 6: Carbon Monoxide

Figure 12

Regional Air Concentrations of Carbon Monoxide



*Note: Selected years. Some regions not monitored for all years. *Yearly concentrations based on second maximum eight-hour averages of CO at state-monitored sites. Concentrations compared to the National Ambient Air Quality Standard (NAAQS). ppm-parts per million. Source: Ky. Division for Air Quality*

Background Carbon monoxide (CO) is a colorless, odorless gas formed when the carbon in fuel is not burned completely. Carbon monoxide may cause serious health problems, including dizziness and slowed reflexes, when the standard is exceeded. At very high levels, CO is poisonous and can lead to death.

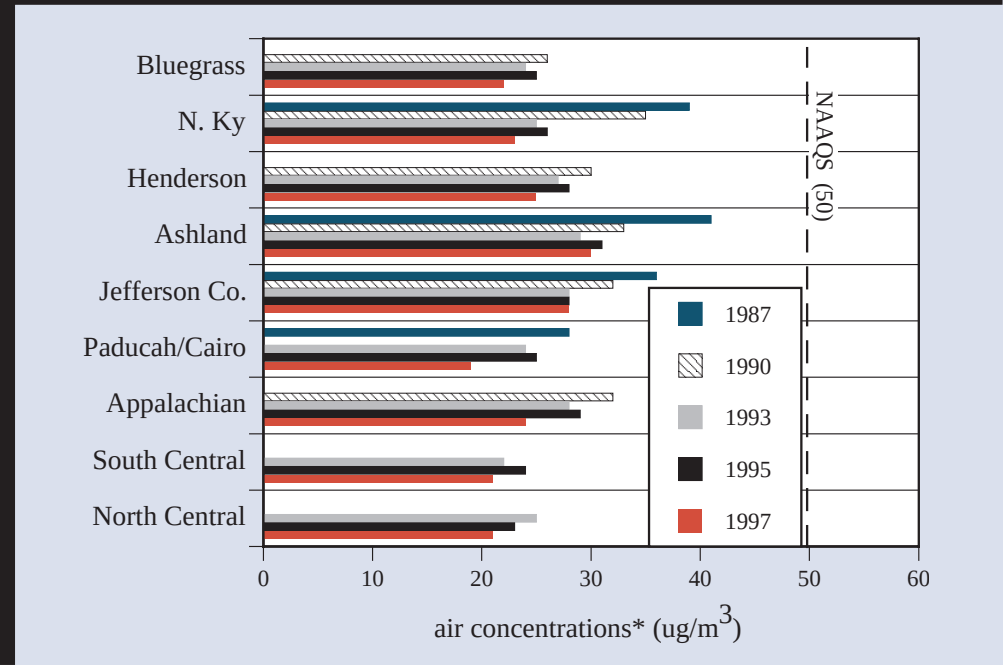
Source Vehicle exhaust accounted for 62% of CO emissions in Kentucky during 1997, with the remainder generated from industrial processes and fuel combustion sources. During 1997, area sources emitted 160,227 tons, onroad mobile emitted 909,123 tons, nonroad mobile emitted 234,607 tons, and regulated point sources emitted 78,100 tons of CO. That year, Alcan Ingot and Recycling in Henderson County led the state with 32% (25,193 tons) of statewide regulated CO emissions followed by Westvaco Corporation (7,981 tons), and National Southwire Aluminum (6,364 tons).

Goal Implement and enforce requirements to meet the national standard of 9.0 ppm for carbon monoxide using various emission control programs and technologies.

Progress All regions of the state currently meet the CO standard. CO air concentrations continue to decline or remain unchanged with the exception of the Bluegrass and Jefferson County regions. Declines are attributed to pollution controls on automobiles. The Ashland area in Boyd County has had periodic exceedances of the carbon monoxide standard.

Indicator 7: Particulates

Figure 13 **Regional Air Concentrations of Particulates (PM_{10})**



Note: Selected years. Some regions not monitored for all years.
** Yearly concentrations based on PM_{10} averages at state-monitored sites. Concentrations are compared to the National Ambient Air Quality Standard (NAAQS). ug/m³-micrograms per cubic meter.*
Source: Ky. Division for Air Quality

Background Particulates are small particles of dust, dirt, chemicals, and soot in the air. Concerns regarding the impacts of particulates on public health prompted the U.S. EPA to issue a PM_{10} standard in 1987 to control particulates 10 microns or smaller. Health effects from exposure to PM_{10} include breathing and respiratory problems, cancer, and premature death. The elderly, children, and people with chronic lung disease are especially sensitive to particulate matter. In 1997, the U.S. EPA issued new health-based standards for particulates less than 2.5 microns in diameter. Based on new health studies, these smaller particulates can be inhaled more deeply into the lungs than PM_{10} particulates, making the new standard more protective of human health. Many of these small particles are chemicals that condense from gaseous emissions, such as nitrates from oxides of nitrogen and sulfates from sulfur dioxide. New $PM_{2.5}$ particulate monitors will be located in 18 counties and will begin monitoring in 1999.

Source Particulates are emitted from cars, construction sites, mineral and metal processes, coal-fired power plants, agricultural operations, and roads. During 1997, area sources emitted 164,577 tons, onroad mobile sources emitted 131,394 tons, nonroad mobile emitted 8,211 tons, and regulated point sources emitted 26,000 tons of PM_{10} (excluding Jefferson County where regulated source data is not available). That year, Pinnacle Processing Inc. in Martin County led the state with 14% (3,669 tons) of the statewide regulated PM_{10} emissions followed by National Southwire Aluminum (1,601 tons), and AK Steel (1,135 tons).

Goal Implement and enforce requirements to meet the national PM_{10} standard of 50 micrograms per cubic meter for particulates and the new federal air quality $PM_{2.5}$ standard for particulate matter less than 2.5 microns in diameter using various emission control programs and technologies.

Progress Air monitors began measuring particulates based on the PM_{10} standard in 1987. All regions of the state currently meet the PM_{10} standard. By the end of 1999, 22 new $PM_{2.5}$ monitoring stations in 18 counties will begin measuring compliance with the new standard.

Indicator 8: Enforcement

Background The Kentucky Division for Air Quality (DAQ) is the principal agency responsible for monitoring and implementing clean air regulations in the state. In addition, Air Pollution Control District of Jefferson County (JCAPCD) was created in 1952 and was approved by the U.S. EPA in 1970 to implement the provisions of the Clean Air Act for the county and metropolitan Louisville.

Source DAQ currently regulates 2,829 industrial and commercial sources of air pollution while JCAPCD regulates 790 facilities and 536 service stations. During 1997,more than 5,000 inspections at permitted facilities were conducted to ensure compliance with permits and regulations.

Goal Ensure air is safe to breathe by enforcing air quality regulations, permits, and agreed orders.

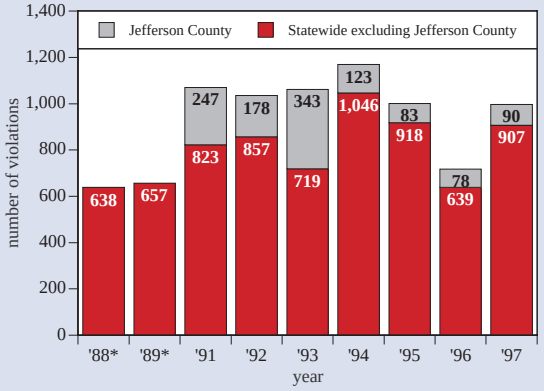
Progress In 1997, 907 violations of air quality rules were cited by DAQ (405 at permitted facilities, 436 at area sources, and 66 asbestos violations). JCAPCD issued 90 air quality notices of violation in 1997 (65 at permitted facilities and 25 for open burning, asbestos and other sources).

Some of the violations cited are the result of complaint investigations. In 1997, more than 2,000 air quality complaints were received by regulatory agencies. Thirty-nine percent of these complaints concerned odors. Many violations cited by DAQ are resolved at the regional office level without the assessment of penalties but some violations result in formal referral to the Central Office for penalty assessment. In 1998, penalties were assessed by the state against 58 industrial facilities, seven commercial contractors, five individuals, and two schools. DAQ also works to resolve violations through the use of Supplemental Environmental Projects (SEPs). During 1997, 17 SEPs were entered into by responsible parties to mitigate $1.2 million in penalties. Recent projects included the placement of ads in newspapers regarding open burning, pollution prevention measures, and the installation of pollution control and other equipment beyond what is required by state regulations.

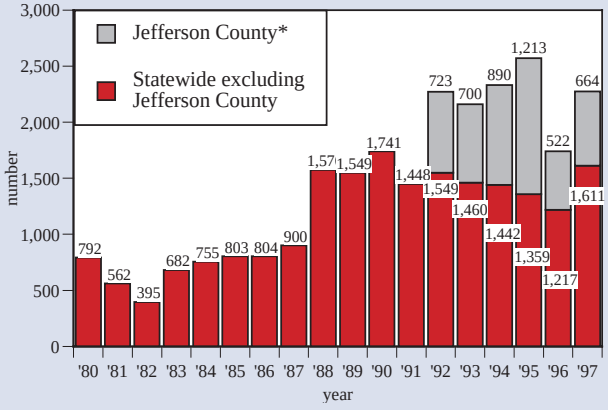
Figure 14

Air Quality Enforcement Indicators

Violations Cited



Complaints



Penalties

Year	State($)	Jeff. Co.($)**
1990	126,500	N/A
1991	1,698,375	N/A
1992	N/A	282,000
1993	847,425	377,000
1994	366,650	N/A
1995	976,500	80,000
1996	1,208,247	35,000
1997	507,450	45,000
1998	850,431	N/A

*Note: 1990 state data unavailable due to computer problems. *Jefferson County data not available for all years. N/A-Data not available. ** Federal fiscal year. Source: Ky. Division for Air Quality, Jefferson County Air Pollution Control District*

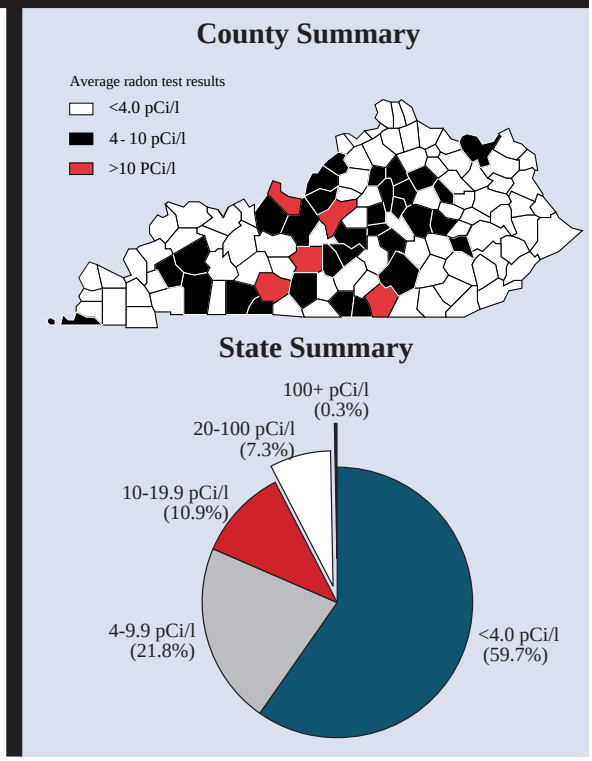
Indicator 9: Indoor Air Quality

Background U.S. EPA studies have found that indoor levels of many pollutants may be two to five times, and on occasion more than 100 times, higher than outdoor levels. These levels are a concern since most people spend as much as 90% of their time indoors. Over the past decade, exposure to indoor air pollutants has increased due to a variety of factors, including the more tightly sealed buildings, reduced ventilation to save energy, the use of synthetic building materials and furnishings, and the use of chemically formulated cleaning and other products.

Source There are many sources of indoor air pollution including the combustion of fuels such as oil and gas, tobacco smoke, building materials such as asbestos-containing insulation and wet carpets, fumes from household cleaning products, central heating and cooling systems, and outdoor sources such as radon and pesticides. The relative importance of any one source depends on how much pollutant is emitted and how hazardous that emission is.

Goal Ensure air is safe to breathe by reducing exposure to indoor air pollution through education and awareness.

Figure 15 Indoor Air Radon Levels in Kentucky



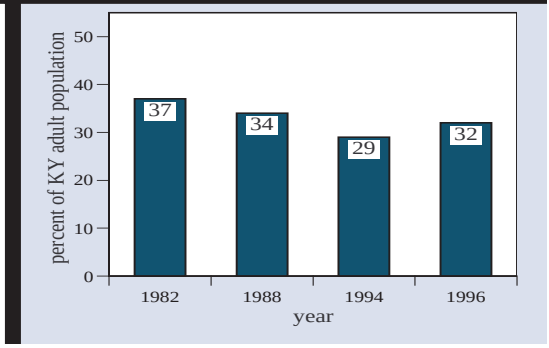
Note: Based on 27,977 radon tests conducted from 1986-1998. 4.0 pico Curies per liter is the health advisory limit established by the U.S. EPA.
Source: Air Chek, Inc.

Progress A major indoor air quality threat in Kentucky is radon. Radon is a known human lung carcinogen. It is a colorless, odorless, gas that occurs naturally and can enter homes through cracks in foundations. The U.S. EPA recommends that all homes be tested for radon. Data from Air Chek, a national radon testing firm, reveal that 40% of the 27,977 homes tested in Kentucky since 1985 had radon levels above 4.0 pico Curies per liter, the health advisory limit set by the U.S. EPA. The highest levels were in Wayne, Hart, Warren, Meade, and Nelson counties. Data is not available to determine how many homes have been mitigated to reduce radon levels.

Several activities have been initiated to reduce exposure to radon including amending the state building codes to specify radon-resistant construction, promoting radon testing and disclosure, and a school testing and mitigation program initiated by the Kentucky Department for Public Health.

Secondhand tobacco smoke is an indoor air pollutant that can contribute to eye, nose, and throat irritation, lung cancer, and heart disease. Kentucky has the nation's highest smoking rate among adults at 32%, according to the U.S. Department of Health and Human Services. The Kentucky Department for Public Health has targeted a smoking rate of no more than 23% of the state's adult population by the year 2000.

Figure 16 Cigarette Smoking Prevalence Among Adults 18 and Over in Ky.

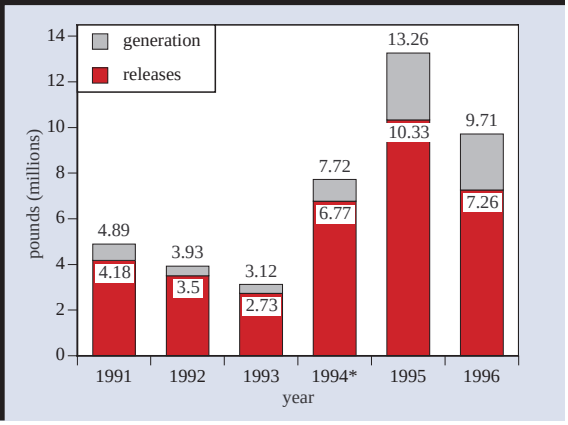


Source: U.S. Department of Health and Human Services

Indicator 10: Ozone-Depleting Chemicals

Background The earth's stratospheric ozone layer protects against the sun's harmful ultraviolet (UV) rays, but human activities have damaged this shield. While ozone concentrations vary naturally, scientists have found that the ozone shield is being depleted well beyond changes due to natural processes. A diminished ozone layer allows more radiation to reach the earth's surface. For people, overexposure to UV rays can lead to skin cancer, cataracts, and weakened immune systems. Increased UV can reduce crop yields and disrupt the marine food chain.

Figure 17
Generation of Ozone-Depleting Chemicals from Industries in Ky.



*Note: Chemical transfers are those chemicals transferred for treatment or recycling. *Chemical releases and transfers of four new chemicals required to be reported in 1994. Source: Toxics Release Inventory Reports, U.S. EPA*

Source In the early 1970s scientists began investigating the effects of various chemicals on the ozone layer, particularly chloroflorocarbons (CFCs), which contain chlorine. CFCs are used as refrigerants, solvents, and blowing agents. Other chlorine-containing compounds include methyl chloroform, a solvent, and carbon tetrachloride, an industrial chemical. When CFCs reach the stratosphere, the radiation from the sun causes them to break apart and release chlorine atoms which react with ozone, starting the chemical cycle of ozone destruction. Similarly, when halons (fire extinguishing agents) and methyl bromide (a soil fumigant) are broken apart, they release bromine atoms, which are 40 times more destructive to ozone molecules than chlorine atoms.

Goal Phase out production of CFCs and other ozone depleters as specified in the Montreal Protocol Treaty.

Progress In 1978, the use of CFC propellants in spray cans was banned in the U.S. In 1987, the Montreal Protocol was signed to protect the earth from the detrimental effects of ozone depletion. Since that time, the treaty has been amended to ban CFC production after 1995 in developed countries and later in developing nations. Currently, 167 countries have signed the treaty.

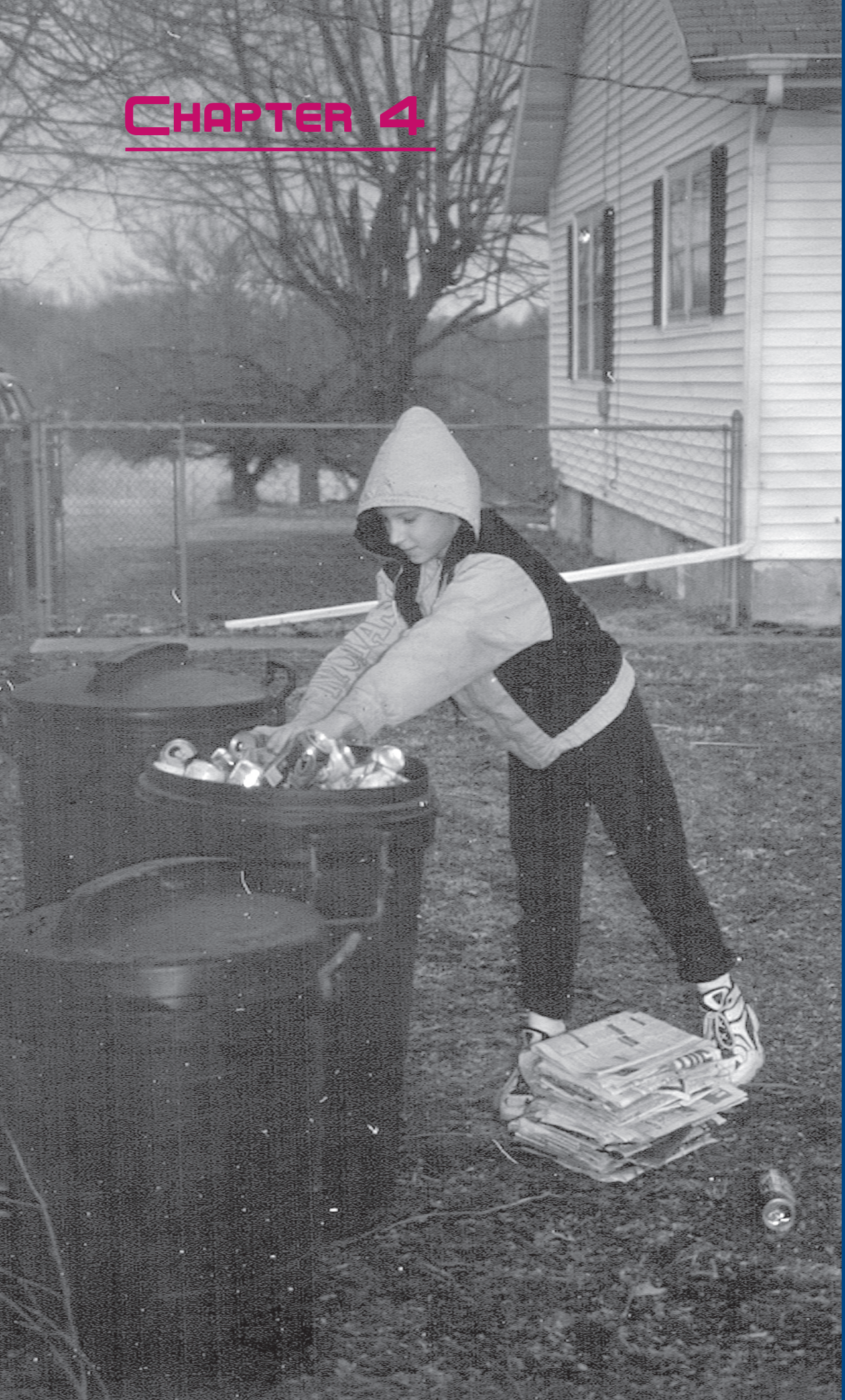
Data from the 1996 Toxic Release Inventory report reveal that 21 companies in the state released 7.25 million pounds of 14 ozone-depleting chemicals. Kentucky ranked top in the nation in on-site releases of ozone depleters that year. Two companies—DuPont and Elf Atochem—accounted for 84% of the total ozone-depleting releases in Kentucky.

The generation of certain ozone depleting chemicals in Kentucky is declining. For example, CFC-12 emissions fell from 621,930 pounds to 37,030 pounds between 1991 and 1996. The use of methyl bromide, a soil fumigant used primarily in the production of tobacco in Kentucky, declined 61% between 1991 and 1997 (from 1.15 million pounds to 431,789 pounds). Three ozone depleters accounted for 92% of the reported 1996 air releases in Kentucky (HCFC-142b, HCFC-22, and HCFC-141b).

Figure 18
Top 10 Ky. Companies Releasing Ozone Depleters to the Air

Company (County)	Pounds
DuPont, Louisville Plant (Jefferson)	3,907,778
Elf Atochem N.A., Inc. (Marshall)	2,226,870
U.S. Enrichment Corp. (McCracken)	317,000
Topy Corp. (Franklin)	176,750
GE Appliance (Jefferson)	123,600
Lordon Co., Inc. (Jefferson)	123,170
Firestone Building Prod. (Kenton)	105,016
Olin Corp. (Meade)	68,718
Jideco of Bardstown (Nelson)	51,655
Okonite Co. (Madison)	45,400
Total top 10	**7,145,957**
Total state	**7,257,430**

Note: Based on 1996 data. Source: Toxics Release Inventory , U.S. EPA



Chapter 4

Waste

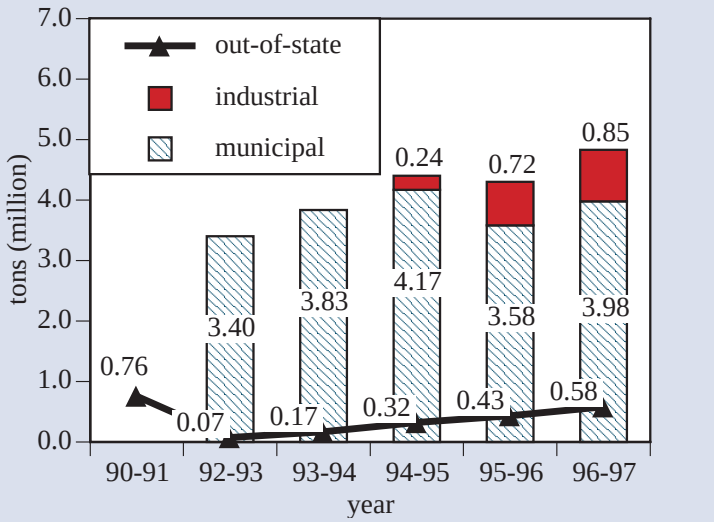
Indicator 1: Municipal Solid Waste Generation and Disposal

Background

National data reveal that Americans continue to generate a significant amount of garbage. During 1960, a person typically generated 2.7 pounds of garbage a day. In 1996, that amount increased 60% to 4.3 pounds of waste per day. The discard rate per person, after recovery and reuse, is estimated by the U.S. EPA at 3.2 pounds per day. Nationwide, 210 million tons of municipal waste were generated during 1996.

Figure 1

Disposal of Solid Waste at Municipal Solid Waste Landfills in Kentucky



Note: Fiscal year (July 1-June 30). Totals rounded. 1990-91 data not available for total waste disposed. Industrial waste data not available for 1992-93, 1993-94. Out-of-state numbers are totaled in municipal and industrial waste.
Source: Ky. Division of Waste Management

Source Municipal solid waste includes durable goods, nondurable goods, containers, food scraps, yard waste and miscellaneous wastes from residential, commercial, and industrial sources. Most of the solid waste generated in 1996 was paper, comprising 38% of the waste stream, followed by yard waste at 13%, food waste 10%, plastics 9%, metals 8%, glass 6%, and other 10%, according to U.S. EPA studies.

Goal Reduce the weight of municipal solid waste disposed at municipal landfills by a minimum of 25% by July 1, 1997, using fiscal year 1993 as a base year per KRS 224.43-010.

Progress In fiscal year 1996-97, 4.83 million tons of waste were disposed at solid waste municipal landfills in Kentucky. Of this total, 3.98 million tons were classified as municipal household and commercial waste and 850,000 tons were industrial solid waste. Of the 4.83 million tons of waste disposed at solid waste landfills, 580,000 tons (12%) were imported from out-of-state, most of which was from neighboring states.

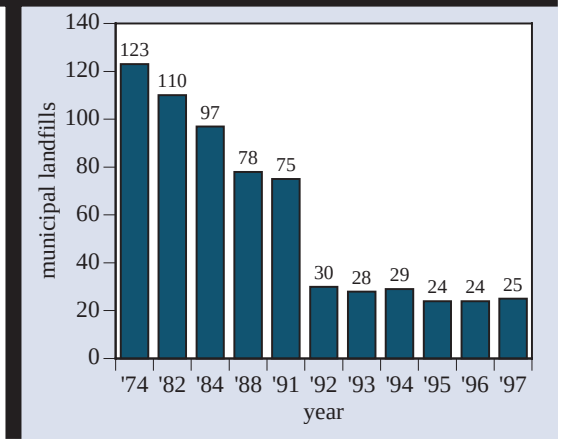
Kentucky has seen the amount of municipal waste disposed at municipal solid waste landfills increase since 1993, likely the result of an increase in the number of households participating in a garbage collection system as well as the cleanup of hundreds of illegal dumps in the Commonwealth. As such, Kentucky has not met its goal of reducing the weight of municipal garbage disposed at landfills by 25%. In fact, the amount of municipal garbage disposed at landfills during fiscal year 1996-97 increased 4% over 1993-94 levels.

Indicator 2: Municipal Solid Waste Landfills and Capacity

Background Kentucky began regulating solid waste disposal in 1969. At that time there were hundreds of landfills and thousands of open dumps which posed public health and environmental threats.

Solid waste issues again moved to the forefront of the state's environmental agenda in 1987, after Kentucky was targeted for solid waste disposal by firms in the Northeastern U.S., where landfill capacity was virtually nonexistent. This issue, combined with the fact that many landfills were leaking contaminants into ground and surface waters, led to the passage of a state law in 1991 to close substandard landfills, better plan and develop state-of-the-art landfills, and ensure the proper disposal of solid waste.

Figure 2 Municipal Solid Waste Landfills in Kentucky



Note: Contained permitted Municipal Solid Waste landfills.
Source: Ky. Division of Waste Management

Source Municipal solid waste (MSW) landfills are operated by private companies, cities, counties, or groups of counties. In addition to the 25 active municipal solid waste landfills, there are approved construction permits for six more MSW landfills.

Goal Provide for the management and disposal of waste in a manner that will protect the public health and welfare; prevent the spread of disease and creation of nuisances, conserve our natural resources; enhance the beauty and quality of our environment; and encourage a regional approach to solid waste management.

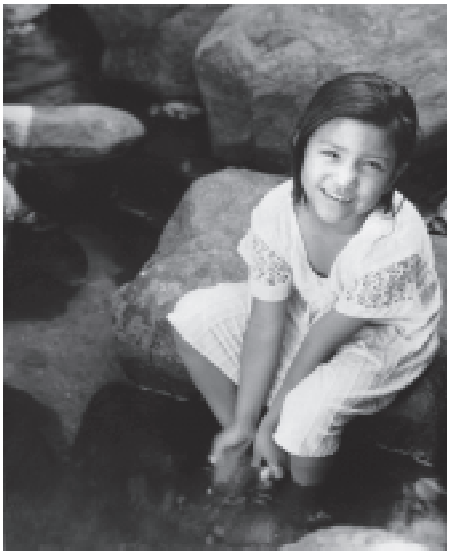
Figure 3 Average MSW Landfill Tipping Fees in Ky.

Year	Tipping Fee/ton
1993	$21.69
1994	$23.49
1995	$24.43
1996	$27.49
1997	$27.50
1998	$27.90

Note: Tipping fee - cost to dispose of a ton of waste. Earlier data not available.

Source: National Solid Waste Mgmt. Assn.; Biocycle, April 1998.

Progress Solid waste laws and regulations enacted in 1991 and 1992 have led to the closure of 56 of the state's 75 MSW landfills. These closed landfills must monitor groundwater for a two-year period and install a leachate collection system (a system to collect and treat liquids leaching from the landfill) if contamination is detected. Groundwater monitoring systems have been installed at 43 of the closed MSW landfills. Fourteen have confirmed groundwater contamination.



Kentucky now has 25 state-of-the-art regional MSW landfills. These landfills must meet stringent construction and operating standards including plastic and clay composite liners (21 landfills) or double composite liners (4 landfills), leachate recovery, and the use of a comprehensive system to monitor groundwater for up to 75 different parameters. The 25 MSW landfills are permitted to provide for 18.95 years of capacity (85.6 million tons).

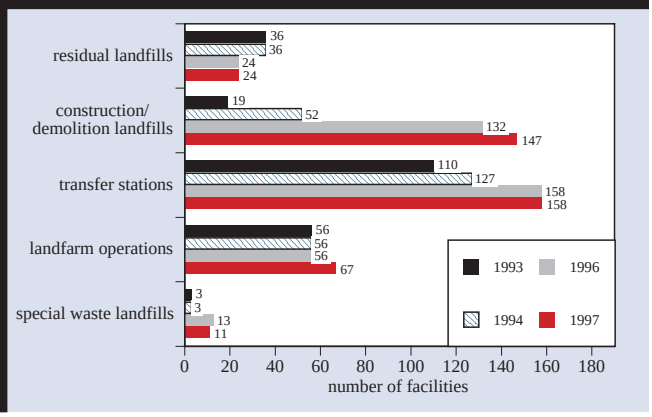
The cost to dispose of a ton of waste at landfills (tipping fee) has increased since the passage and of the 1991 solid waste law and stricter construction and operation standards for MSW landfills took effect. Trends reveal that tipping fees have leveled out during the past few years. However, there is concern, given the consolidation that is occurring within the waste management industry, tipping fees may rise in the future.

Indicator 3: Waste Management Facilities

Background In addition to municipal solid waste landfills, Kentucky has other waste management facilities including construction/demolition debris (CDD) landfills, residual landfills, landfarms, and special waste landfills.

Each of these solid waste management facilities receives various types of waste and has different monitoring and closure requirements. CDD landfills are designed to receive construction and demolition debris or other inert waste. CDD landfills give municipalities a low-cost alternative for the disposal of inert waste. The average cost to dispose of waste at CDD landfills is $7 to $10 a ton compared to $27.90 a ton at MSW landfills.

Figure 4
Number of Solid Waste Management Facilities in Kentucky



Note: In 1997, there were 21 CDD landfills greater than one acre and 126 less than one acre.
Source: Ky. Division of Waste Management

Residual landfills are operated by industries to dispose of solid waste by-products from the manufacturing process. Special waste landfills are designed to dispose of high-volume low-hazard wastes such as mining waste or fly ash generated by power plants. Landfarms are operations that land apply solid waste, biosolids (wastewater treatment sludge) or special waste.

Source In 1997, there were 147 construction/demolition debris landfills, 24 residual landfills, 11 special waste landfills, and 67 landfarms permitted to operate in Kentucky.

Goal Ensure proper construction, operation, and closure of solid waste management facilities to protect public health and welfare, prevent the spread of disease and creation of nuisances, conserve natural resources, and enhance the beauty and quality of the environment.

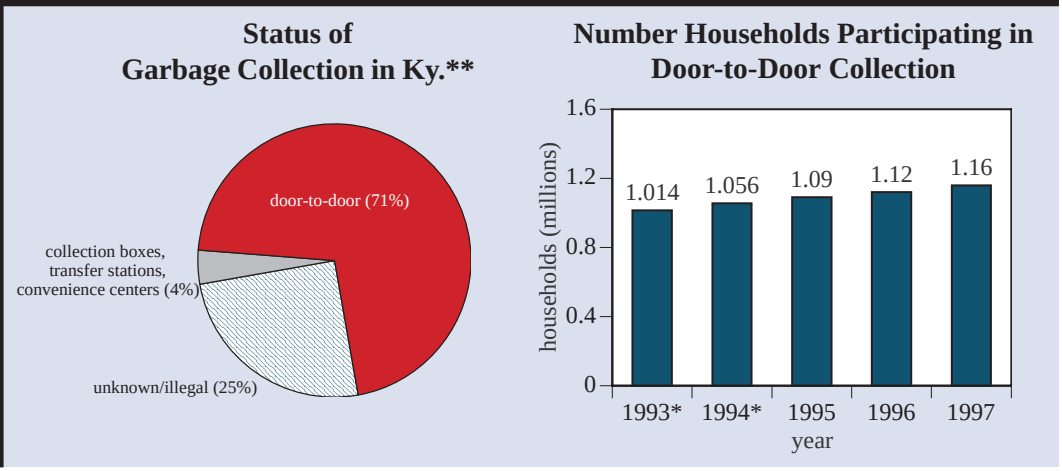
Progress The number of CDD landfills continues to increase in Kentucky. CDDs less than one acre are exempt from groundwater monitoring and reporting requirements. Of the 147 CDDs, 126 are less than one acre. During fiscal year 1997, 878,671 tons of waste were disposed of at the 21 CDD landfills greater than one acre—12 of which had groundwater contamination problems.

In 1997, 768,571 tons of waste were disposed of at the 24 residual landfills operating in the state. All 24 of the residual landfills in Kentucky are monitoring groundwater and ten have confirmed groundwater contamination.

Special waste landfills have increased in Kentucky from three in 1993 to 11 in 1997. In 1997, 2.2 million tons of waste were reported disposed of at special waste landfills. Two of the 11 special waste landfills have confirmed groundwater contamination. Of the 67 landfarm operations permitted to operate in Kentucky, three are required to monitor groundwater and one has detected contamination.

Indicator 4: Garbage Collection

Figure 5 Households Participating in Garbage Collection



*Note: * Based on households participating in garbage collection (not broken down by door-to-door collection for these years). **Based on 1,638,000 homes per 1996 Census. Source: Ky. Div. of Waste Mgmt., State Data Center*

Background Garbage collection has long been a challenge in Kentucky. In 1991, only 14 counties offered residents door-to-door garbage collection services. Illegal disposal of garbage prompted the state to adopt a universal collection law in 1990 to help curb open dumping. As a result, 113 counties now have door-to-door as their primary means of garbage collection. However, while the law specifies that counties must provide collection services, it does not mandate participation.

Source The primary responsibility for municipal waste collection rests with county governments. Each county has developed a plan detailing a comprehensive approach to collecting, disposing, and reducing solid waste.

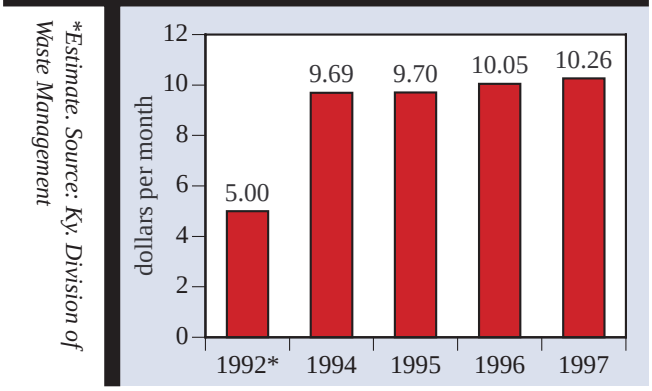
Goal Provide for county universal garbage collection programs by July 1, 1994. The collection programs can be door-to-door, direct-haul to a staffed convenience station, or other alternatives approved by the Natural Resources and Environmental Protection Cabinet.

Progress All counties have enacted garbage collection ordinances. But most ordinances are voluntary in nature. Only 20 counties have passed mandatory garbage collection ordinances.

County solid waste reports for 1997 indicate that an estimated 71% of Kentucky households participated in a door-to-door garbage collection system. But participation rates vary greatly by county—from 100% in Jefferson County to 28% in Knox County. Average monthly garbage collection fees have increased from $9.69 a month in 1994 to $10.26 a month in 1997.

Counties also reported that 4% of the state's households hauled their garbage to transfer stations, convenience centers, or collection boxes. It is not known how the remaining 25% of households disposed of an estimated 3.35 million pounds of garbage a day, since there is no statewide system in place to track other disposal methods other than door-to-door collection. Some of this waste may be properly disposed while some may be illegally dumped.

Figure 6 Average Monthly Residential Garbage Collection Fees in Ky.

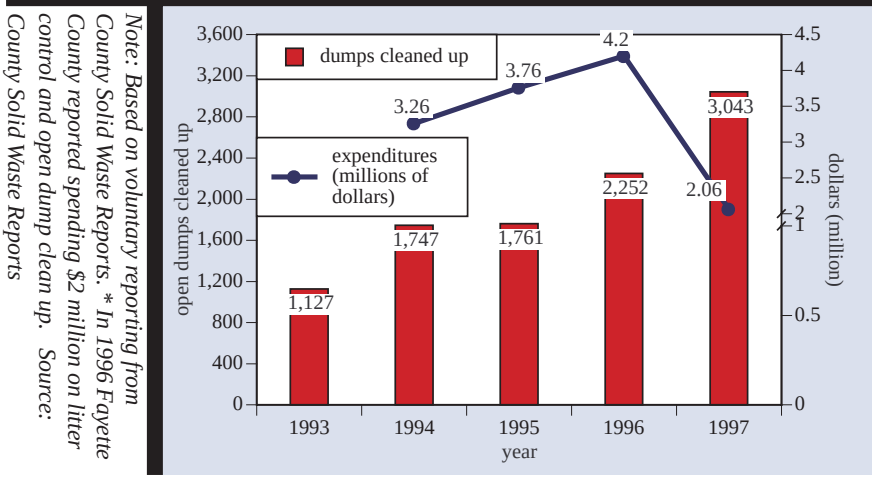


**Estimate. Source: Ky. Division of Waste Management*

Indicator 5: Open Dumps

Figure 7

Open Dump Cleanups and Expenditures in Kentucky



*Note: Based on voluntary reporting from County Solid Waste Reports. * In 1996 Fayette County reported spending $2 million on litter control and open dump clean up. Source: County Solid Waste Reports*

Background Each and every day tons of garbage are illegally dumped in rivers, down hillsides, and along roads polluting the environment and despoiling the beauty of our landscape. While the exact amount of garbage illegally disposed is unknown, thousands of open dumps attest to the fact that illegal dumping remains a considerable problem in the Commonwealth.

Source An estimated 1.23 million households (75% of the state's households) participated in some system of garbage collection in 1997. It is not known how the remaining 25% of the state's households disposed of an estimated 3.35 million pounds of garbage a day. Some of this waste may have been hauled to a collection station while some may have been illegally dumped.

Goal To encourage state and local governments, business, industry, civic groups, environmental groups, and citizens to work together to clean up Kentucky and to educate citizens about the importance of proper garbage disposal.

Progress The state has made impressive gains during the past few years in cleaning up open dumps. In 1996, the Natural Resources and Environmental Protection Cabinet (Cabinet) initiated a campaign to stop illegal dumping. The Cabinet joined with other agencies to promote greater public awareness of the threats posed by illegal dumping and to step up enforcement of open-dump laws. A statewide toll-free hotline (1-888-NO-DUMPS) was established in April 1996 to provide Kentuckians an opportunity to report open dumps.

As a result of the campaign, the efforts of local solid waste management officials, and other organizations such as PRIDE, 3,043 open dumps were reported cleaned up in 1997 by the county officials—an increase of 35% over 1996 cleanups. That year, county officials issued 7,806 citations for illegal dumping, littering, and failure to participate in mandatory garbage collection systems. Of the 7,806 citations, 553 were addressed through the courts and 502 resulted in court actions. Bell County led the state with 677 citations issued in 1997 followed by Leslie County with 300 citations. The Cabinet also inspected 2,406 illegal dumps and issued 1,590 notices of violation since 1997, resulting in violators cleaning up 490 illegal dumps. The Cabinet recently purchased video surveillance equipment to help catch open dump violators.

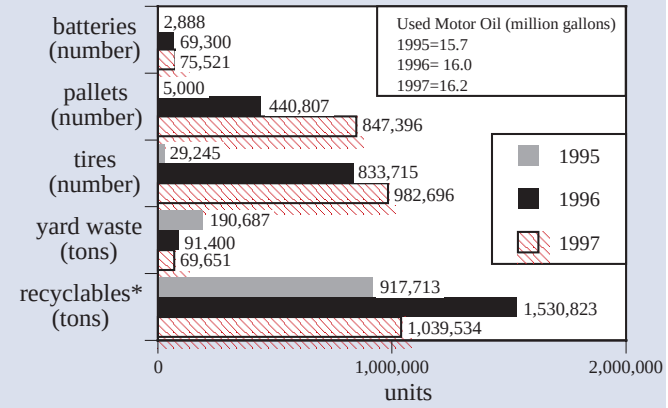
Many counties have hired solid waste coordinators to promote proper solid waste management. Counties with solid waste coordinators have steadily increased—from 40 in 1992, to 88 in 1995, and to 97 in 1997. Ninety counties have also enacted open dump ordinances to give local officials authority to cite and prosecute violators.

State efforts to address the problem of waste tires proceed. Each year, Kentuckians produce 3.8 million waste tires. In 1998, the state spent $2.6 million to clean up seven waste tire piles containing an estimated 2.8 million tires. The General Assembly passed House Bill 636 in 1998 to strengthen the state's waste tire program. A $1 fee for each new tire purchased will be used to clean up tire piles and prevent new ones. A major initiative of the program is county-based tire amnesty programs to collect waste tires on a one-time basis free of charge from individuals, farmers, and small businesses. By 2002, all counties will hold waste tire amnesty days. In 1998, five counties held amnesty days and collected 43,915 waste tires.

Indicator 6: Recycling

Background Public awareness of the need to reduce, reuse, and recycle wastes continues to grow. More and more households are recycling their waste. The U.S. recovered an all-time high of 45 million tons of paper in 1997, according to Recycling Times. This represents a 5% gain from the amount recovered in 1996. The aluminum industry also reports an estimated 66% of the 101 billion aluminum cans produced nationally were recycled in 1997. In addition to extending the life of landfills, recycling may also prove to be an important tool in reducing global warming. The U.S. EPA estimates that recycling of municipal solid waste lowers energy requirements for making products with virgin materials. In addition, recycling paper products helps reduce timber harvests, leaving trees to act as carbon sinks, which can further reduce greenhouse gas concentrations in the atmosphere.

Figure 8 Collection of Recyclables in Kentucky



*Note: *Aluminum, newspapers, cardboard, paper, glass, plastic. Source: Ky. Division of Waste Management, County Solid Waste Reports which include data on public and private sector collection, where available.*

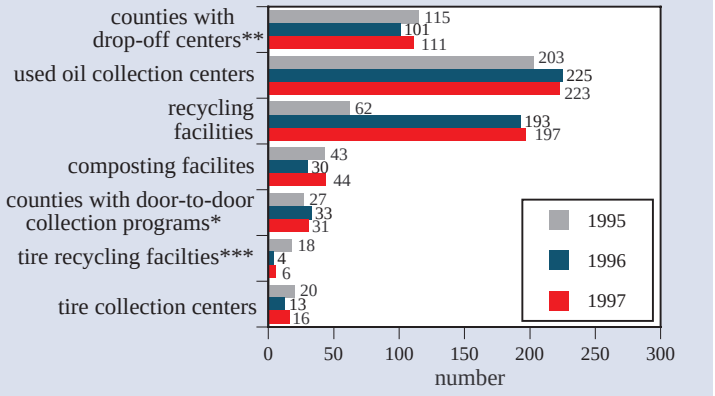
Source Recycling programs vary throughout the Commonwealth. Most Kentucky residents are now within reach of a recycling operation. In 1997, 111 counties had recycling drop-off centers, 36 had composting facilities, and 31 counties had door-to-door recycling collection programs.

Goal Reduce the weight of municipal solid waste disposed at municipal landfills by a minimum of 25% by July 1, 1997, using fiscal year 1993 as a base year per KRS 224.43-010.

Progress Kentuckians are doing their part to recycle wastes. The Commonwealth's recycling rate was 28% in fiscal year 1997, according to the Kentucky Division of Waste Management. This is an improvement over its 1990 recycling rate of 17%. During 1997, more than a million tons of recyclables were reported collected. However, it is not possible to determine how much of this waste was actually recycled, since recyclers are not required to report this information to the state.

The Kentucky Division of Waste Management formed the Buy Recycled Alliance in 1998 to promote the use of recycled products in the state. To date, 179 organizations have joined the Alliance and made commitments to buy recycled products.

Figure 9 Recycling Facilities and Programs in Kentucky



*Note: *Counties where one or more communities have door-to-door collection of recyclables. **Some counties have more than one drop-off facility. ***There are two tire recyclers in Kentucky; the number indicated in the chart also includes tire transporters. Source: Ky. Division of Waste Management*

Indicator 7: Solid Waste Enforcement

Background Kentucky has passed numerous laws and regulations to ensure the safe disposal of solid waste. But the state still faces numerous solid waste issues—from household garbage collection to ensuring proper operation of landfills and other waste management facilities. Enforcement of solid waste rules provides a good indicator of the state's commitment to carrying out solid waste rules and regulations and ultimately how effective Kentucky is in meeting its waste management goals.

Source The Kentucky Division of Waste Management currently permits and regulates 407 solid waste disposal facilities. In addition, the Division responds to complaints regarding waste activities.

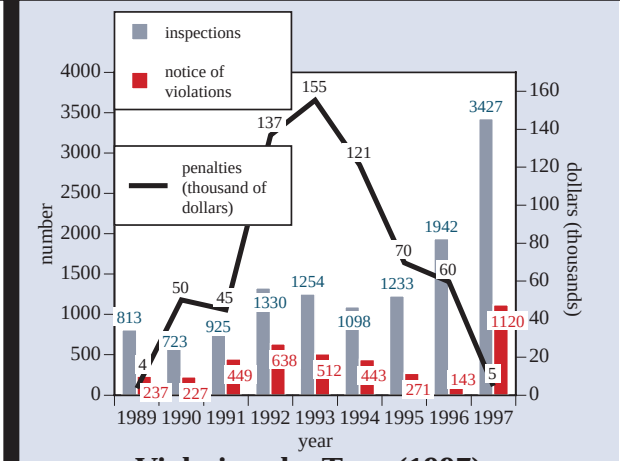
Goal Ensure compliance with state and federal solid waste laws and regulations.

Progress A review of the Kentucky Division of Waste Management's solid waste enforcement trends reveals a dramatic increase in inspections and violations cited since 1995. In 1995, there were 1,233 inspections, 271 violations cited, and $70,000 in penalties assessed. By 1997, the number of inspections more than doubled to 3,427 and the number of violations cited rose fourfold to 1,120. However, the total amount of solid waste penalties assessed declined from $70,000 in 1995 to $5,000 in 1997.

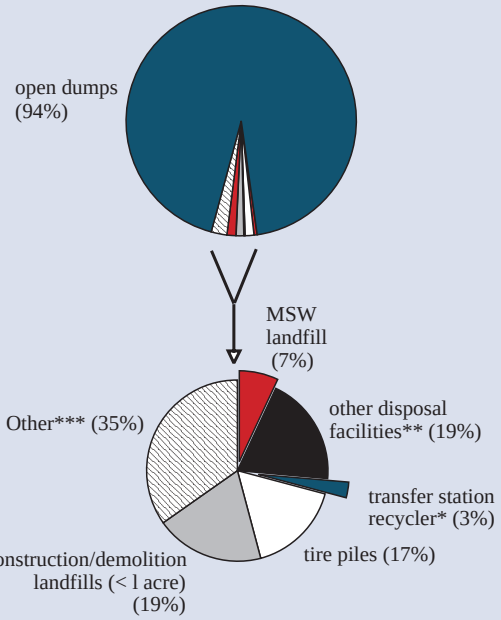
These changes are most likely in response to the Natural Resource and Environmental Protection Cabinet's 1996 Open Dump Campaign. During 1997, the single largest category of solid waste violations was open dumping, which constituted 94% of the violations cited. Penalties are often difficult to assess against open dumpers due to the difficulty of identifying violators. When a violator is identified, the Cabinet has focused on persuading the responsible party to clean up the dump in lieu of a penalty. From June 1997 to October 1998, responsible parties cleaned up 450 open dumps as part of the Cabinet's Open Dump Campaign.

Figure 10

Solid Waste Enforcement/Compliance Trends in Kentucky



Violations by Type (1997)

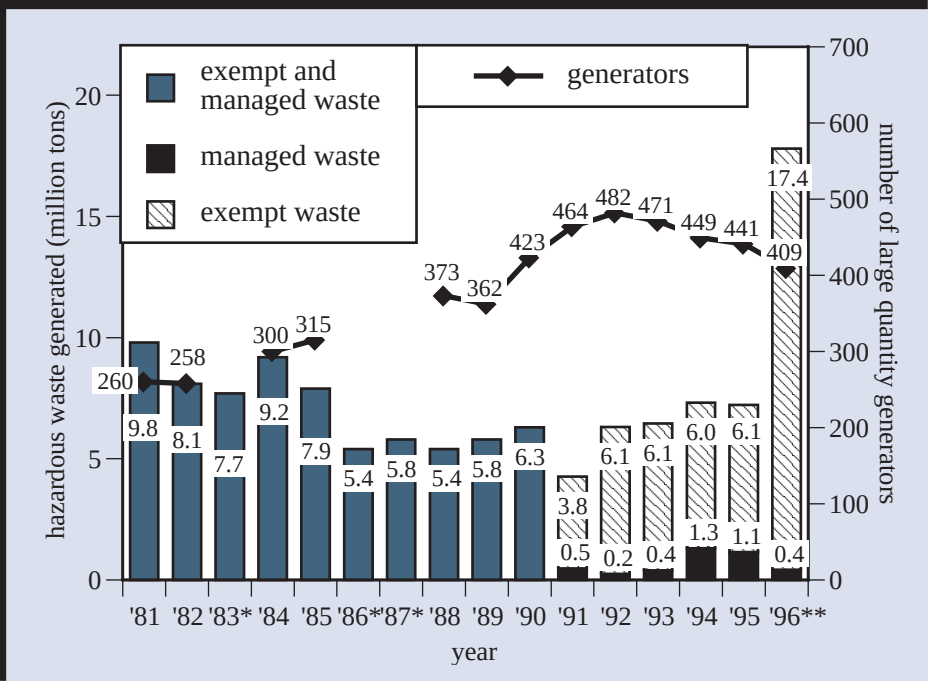


**Includes recyclers and local drop-off points/stations for solid waste. **Permitted CDDs, residual, and special waste landfills, landfarms, compost facilities. ***Junkyards, sawdust piles, oil and brine pits, septic tanks, convenience centers, road oilings, sludge giveaway. Chart uses revised data from the NREPC computer system which may differ from previous EQC reports. Source: Ky. Division of Waste Management*

Indicator 8: Hazardous Waste Generation

Figure 11

Hazardous Waste Generation in Kentucky



*Note: Based on large quantity generators. Does not include remediation waste. Exempt waste is primarily corrosive wastewater treated on-site and is exempt from most hazardous waste permitting requirements. Managed waste is generally more complex chemicals requiring more sophisticated treatment subject to hazardous waste permitting. Totals rounded. *Generator data not available. **Improved reporting accounts for nearly threefold increase in exempt waste during 1996. Source: Ky. Div. of Waste Management*

BACKGROUND Hazardous waste has the potential to cause serious health and environmental threats if not managed properly. Hazardous waste is regulated under the federal Resource Conservation and Recovery Act of 1976 (RCRA). The U.S. EPA has established criteria and testing methods for hazardous waste that exhibits characteristics of ignitability, corrosivity, reactivity, or toxicity. Wastes resulting from certain industrial processes, unless exempted, are designated as hazardous and are referred to as "listed" wastes. Both federal and state hazardous waste laws primarily focus on the management of RCRA hazardous waste produced by large quantity generators. A large quantity generator is defined as producing 2,200 pounds of hazardous waste in a given month, or 2.2 pounds or more of acutely hazardous waste a month, or 220 pounds of spill cleanup material in a given month.

SOURCE In 1996, the most recent year data is available, 409 large quantity generators in Kentucky produced 17.8 million tons of hazardous waste. Ninety-eight percent of the waste was classified as exempt hazardous waste, which is primarily corrosive wastewater that is treated in units exempt from hazardous waste permitting requirements. This treated waste is discharged through state water permits to surface waters or to publicly owned wastewater

Figure 12

Top 10 Generators of Exempt Hazardous Waste (1996)

Company (City)	Tons
Ashland Petroleum (Catlettsburg)	8,846,000
DuPont (Louisville)	2,406,250
B.F. Goodrich (Calvert City)	2,316,333
Westlake Monomers (Calvert City)	789,919
Elf Atochem (Calvert City)	721,600
Engelhard Corp. (Louisville)	389,473
Dow Corning (Carrollton)	306,260
B.F. Goodrich (Louisville)	300,153
DuPont Dow Elastomers (Louisville)	175,000
Gamco Products (Henderson)	164,848
Total Top Ten	**16,415,836**
Total State	**17,377,487**

Exempt waste is primarily corrosive wastewater treated on-site and is exempt from most hazardous waste permitting requirements. Source: RCRIS Database

treatment plants. The remaining 2% of the waste generated was classified as managed waste. These wastes primarily include ignitable wastes such as gasoline, mineral spirits and paint thinners; solvents such as dry cleaner solvents and engine degreasers; and other chemical and toxic wastes. Managed wastes are generally more complex chemicals that require specialized treatment technologies subject to hazardous waste permitting requirements.

The top ten generators of RCRA-exempt hazardous waste were responsible for 94% of the 17.37 million tons of waste generated in the state during 1996. The top ten generators of RCRA managed waste account for 78% of the 423,529 tons of waste generated in the state during 1996. There are many other businesses that create hazardous waste in small amounts, but generation data is not collected from small quantity generators or other small users or handlers of hazardous waste.

Figure 13

Top 10 Generators of Managed Hazardous Waste In Ky. (1996)

Company (City)	1990 Tons	1995 Tons	1996 Tons
Ken Dec (Horse Cave)	712	192,724	192,470
Safety-Kleen* (Smithfield)	43,744	83,576	55,351
Gallatin Steel (Warsaw)	**	7,632	21,648
LWD* (Calvert City)	8,003	11,599	12,036
ECSI (Brooks)	19,449	9,331	11,200
Rohm and Haas (Louisville)	20,006	13,196	10,552
Ashland Petroleum (Catlettsburg)	703	408	8,829
Koppers (Guthrie)	20	85	6,881
ISP Chemicals (Calvert City)	9,350	6,585	6,345
Superior Graphite (Hopkinsville)	135	1,826	4,621
Total Top Ten	**102,132**	**326,962**	**329,934**
Total State	**Not Available**	**1,149,881**	**423,529**

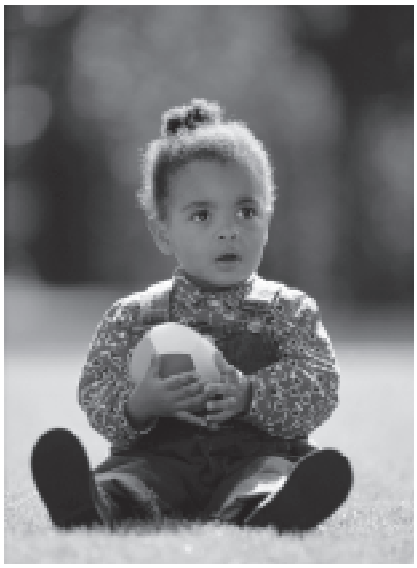
*Note: Managed waste is generally more resistent chemicals requiring more sophisticated treatment subject to hazardous waste permitting. *Treatment, storage, disposal facility. **Not operating. Source: RCRIS Database and RTK.net BRS database*

Goal Reduce the amount of hazardous waste produced by each generator regulated under Title III, Section 313 of the Superfund Amendments and Reauthorization Act of 1986 and KRS 224.46-305 by 25% by 1997 and 50% by the year 2002, using 1987 as the base year.

Progress Because of hazardous waste reclassifications and other regulatory changes made from year to year, it is difficult to measure whether Kentucky has met its 25% reduction goal. Complicating this further is the fact that some large quantity generators appear to have failed to properly report hazardous waste generation. For at least two of the state's largest generators, Ashland Inc. and DuPont, this oversight was corrected in 1996. These two companies alone nearly tripled the amount of exempt waste reported in the state during 1996.

A review of the top ten generators/handlers of managed hazardous wastes during 1996 reveals that few companies have reduced the amount of waste produced. A notable exception is Rohm and Haas in Louisville. The chemical company cut managed hazardous waste production by nearly 50% between 1990 and 1996.

The U.S. EPA and the Kentucky Department for Environmental Protection are now focusing on reducing hazardous wastes containing toxic chemicals that are more persistent and bio-accumulative. Mercury is ranked top among these wastes. The leading generator of mercury-containing waste in the state is B.F. Goodrich. Between 1989 and 1997, B.F. Goodrich plants in Kentucky (Calvert City and Louisville) reduced mercury-containing wastes by 38%, from 47.5 tons to 29.6 tons. However, statewide there was an overall increase of 2.5% (477,947 tons in 1989 to 489,983 tons in 1997) in the production of mercury-bearing waste.



Indicator 9: Hazardous Waste Treatment and Disposal

Figure 14

Hazardous Waste Treatment and Disposal Methods in Kentucky

Treatment	1993 (tons)	1995 (tons)	1996 (tons)
aqueous organic	2,181,628	1,808,026	9,255,931
other treatment	2,079,075	2,281,184	5,797,407*
aqueous inorganic	2,001,389	1,208,224	1,447,973
aqueous inorganic/org.	150	274,313	296,433
energy recovery	58,910	89,248	71,193
disposal**	21,731	26,679	22,696
incineration	21,847	43,738	20,724
other recovery	41	42,828	6,686
solvent recovery	8,369	7,040	4,218
fuel blending	42,977	5,629	3,857
stabilization	3,445	3,843	3,776
metals recovery	3,094	2,326	1,954

*Note: Large quantity generator waste. Does not include waste imported into Ky. for disposal or treatment because data is not available. Earlier data not available. *Increase attributed to start up of Calgon Carbon which uses carbon to treat and destroy organic solvents and gases. **Landfills, waste piles, impoundments, landfarms. Source: RCRIS Database*

Background Hazardous waste generally must be treated before it can be disposed of. Different types of hazardous waste require different types of treatment and disposal. Facilities that treat, store, or dispose of hazardous waste must meet rigorous federal and state operating and closure requirements.

Source In 1996, 12 commercial hazardous waste treatment, storage, and disposal facilities (TSDF) and 24 private TSDFs (facilities that treated its waste on-site) were permitted to operate in the state.

Goal Ensure the adequate treatment and disposal of hazardous waste consistent with state and federal rules and consistent with a national philosophy which emphasizes prevention over disposal. Specifically the U.S. EPA has promoted a hierarchy of waste management with the preferred option to reduce waste generation followed by recycling, treatment, and disposal.

Progress During 1996, 96% of the hazardous waste produced in Kentucky was chemically treated at the site of generation to render it nonhazardous. Most of these wastes were corrosive wastewater which was treated and discharged to waterways or to a publicly owned wastewater treatment plant under conditions specified in state KPDES water discharge permits and pretreatment programs.

Some hazardous waste requires more sophisticated treatment and disposal due to its hazardous constituents. These wastes include solvent and sludge wastes, inorganic and organic chemical wastes, toxic hazardous wastes, and many other hazardous chemical wastes. These wastes are stored, treated, or disposed at a TSDF permitted in the state or sent out of state for treatment or disposal. There are different types of TSDFs including hazardous waste incinerators, fuel blenders, and waste recovery facilities. The amount of waste received by commercial TSDFs varies from year to year based on waste generated as well as the amount of waste materials removed from spill sites and contaminated waste sites.

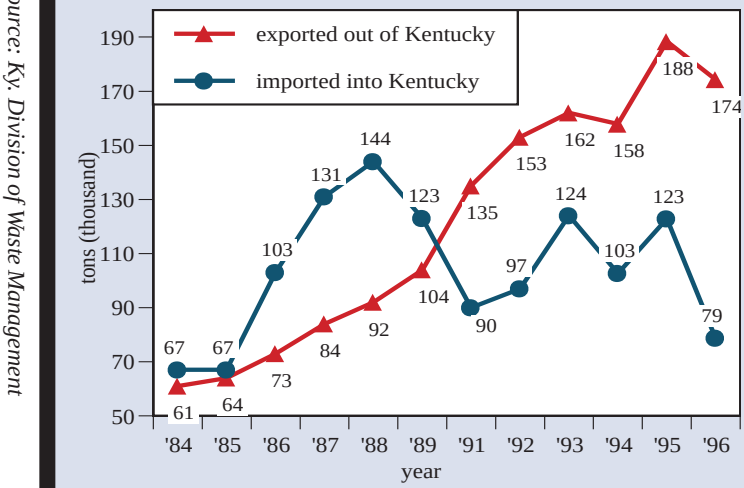
While the waste management hierarchy ranks recycling as its second best option, only a small portion of Kentucky-generated hazardous waste, 84,051 tons, was recovered for metals, solvents, or other materials. Most of Kentucky-generated waste was chemically treated in 1996. Another 22,696 tons were disposed of in a landfill, impoundment, a waste pile, or landfarm. Ashland Inc. in Boyd County operated the only hazardous waste landfill during 1996. The landfill was permitted to receive company-generated hazardous and solid waste. The Ashland Inc. landfill no longer receives hazardous waste. A portion of hazardous waste generated in Kentucky during 1997 was also treated at one the three hazardous waste incinerators operating in Kentucky: Elf Atochem at Calvert City and Carrollton, and LWD in Calvert City. LWD operates the state's only commercial hazardous waste incinerator. LWD is currently operating under an interim permit.

Indicator 10: Hazardous Imports and Exports

Background Kentucky, like most states, relies on facilities both inside and outside its borders for the treatment and disposal of hazardous wastes. The amount of waste imported and exported into Kentucky can vary significantly from year to year.

Figure 15

Hazardous Waste Imports and Exports in Kentucky



Source: Ky. Division of Waste Management

Source During 1996, hazardous waste generated in Kentucky was shipped to 32 states for treatment and disposal. That year, hazardous waste was also imported into Kentucky from 44 states, including Puerto Rico, and from at least one foreign country for treatment and disposal.

Goal Ensure the adequate treatment and disposal of hazardous waste consistent with state and federal rules.

Progress Kentucky remains a net exporter of hazardous waste. The state exported 174,300 tons of hazardous waste out of state for treatment and disposal in 1996. This represents less than 1% of the 17.8 million tons of hazardous waste generated in the Commonwealth.

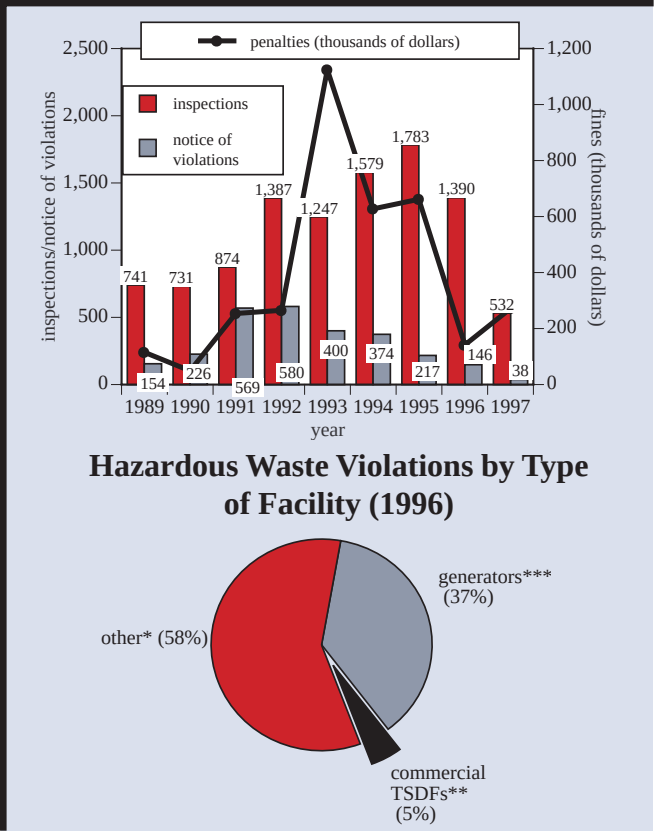
Between 1995 and 1996, the amount of waste imported into Kentucky for treatment or disposal decreased by 36%—from 123,000 tons to 79,000 tons. The Kentucky Division of Waste Management indicates that this decrease was likely due to a decline in the amount of remediation waste from contaminated sites imported into Kentucky. During 1996, treatment, storage, and disposal hazardous waste facilities processed 78,743 tons of RCRA hazardous waste imported into the Commonwealth.

Safety-Kleen (39,008 tons), LWD Inc. (40,556 tons), and LWD Sanitary Landfill (12,102 tons) treated or disposed of 75% of the waste imported into Kentucky, according to state records. LWD (the only commercial incinerator in Kentucky) incinerated 23,510 tons of hazardous waste in 1996—a 39% decrease from 1995.

Indicator 11: Hazardous Waste Enforcement

Figure 16

Hazardous Waste Enforcement and Compliance Trends in Kentucky



Hazardous Waste Violations by Type of Facility (1996)

*Note: *Used oil marketers, transporters, non-notifiers, limited quantity generators, illegal disposal. **Permitted treatment, storage, disposal facilities that receive waste from off-site. ***Large and small quantity generators. Chart uses revised data from NREPC computer system which may vary from previous EQC reports.*
Source: Ky. Division of Waste Management

Background Kentucky began regulating hazardous waste in 1979. State hazardous waste permitting and enforcement programs were later put in place in 1982. State hazardous waste regulatory programs have evolved since then, and now include monitoring, record keeping, emergency planning, closure procedures, and identification and cleanup of waste sites. While these efforts have significantly reduced environmental and public health risks, contaminated waste sites, spills, as well as improper management and illegal disposal, continue to pose problems throughout the Commonwealth.

Source In 1997, there were a number of sources subject to hazardous waste laws and regulations in Kentucky including 397 large quantity hazardous waste generators; 36 treatment, storage, and disposal facilities; 274 transporters; and 1,819 conditionally exempt small quantity generators.

Goal Ensure that hazardous waste generators and handlers are brought into compliance with state laws and regulations within the shortest possible time after the detection of any violation.

Progress The Kentucky Division of Waste Management is the principal regulatory agency in the state responsible for ensuring that hazardous wastes are properly managed and disposed. In 1995, the number of inspections conducted by the Division reached a record high of 1,783, but by 1997, the number of inspections had fallen 70% to 532. The decline is attributed to a shift in priorities by the Natural Resources and Environmental Protection Cabinet to a greater enforcement emphasis on underground storage tanks and open dumps.

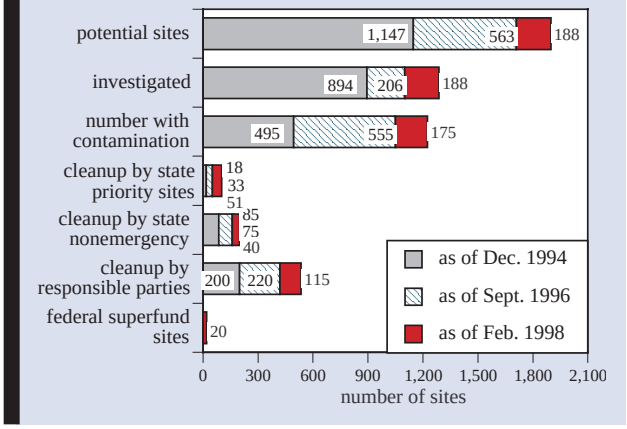
Hazardous waste violations cited also declined in 1997 to their lowest level since EQC began tracking violations in 1989. In 1997, 38 violations were issued by the Kentucky Division of Waste Management and $271,600 in penalties was assessed. More than half, 58%, of the violations occurred at used oil marketers, transporters, limited quantity generators, and for the illegal treatment, storage or disposal of hazardous waste.

Indicator 12: Contaminated Waste Sites

Background In Kentucky, hundreds of old or abandoned waste sites pose significant threats to the environment and public health. Sites that are highly contaminated, or pose an immediate public health threat, may be proposed for inclusion on the U.S. EPA "National Priority List" (NPL), better known as Superfund. Contaminated sites that do not qualify for Superfund status become the state's responsibility to oversee site assessment, cleanup, and future monitoring.

Source Past hazardous waste management practices have led to numerous contaminated waste sites across the state. Some common sites include abandoned warehouses, manufacturing facilities, processing plants, and landfills.

Figure 17 Contaminated Waste Sites in Kentucky



Source: Ky. Division of Waste Management

Goal Eliminate the health and environmental threats posed by contaminated waste sites.

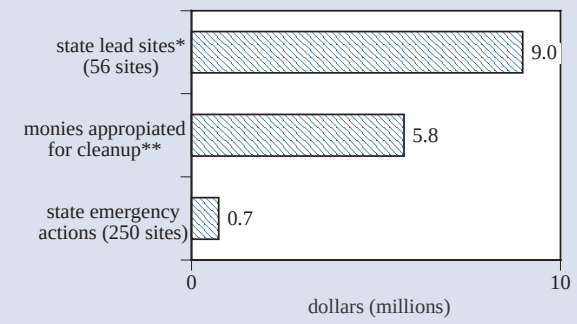
Progress Nearly 1,900 potential contaminated waste sites have been identified in Kentucky. And every year more are discovered. Of the 1,288 hazardous waste sites investigated, 1,255 had confirmed contamination and 66% had been remediated by the state or responsible parties.

A primary source of funds to clean up contaminated waste sites where responsible parties cannot be found or are financially unable to cleanup a site is the Kentucky Hazardous Waste Management Fund. The fund, established in 1981 and later amended in 1990, is financed through a fee on hazardous waste produced. Each year, about $2.1 million is collected from hazardous waste generators to finance site cleanups. Since 1992, the fund has been used to investigate and remediate 56 contaminated waste sites and conduct 250 emergency removal operations at a cost of $9.7 million. The Hazardous Waste Management fund is scheduled to sunset June 30, 2000.

Because of the sheer number of sites needing remediation, the Kentucky Division of Waste Management has prioritized the clean up of 21 sites based on environmental and public health threats. Three of these sites are under review, ten are being investigated, seven have a cleanup design under development, and one site has been contained.

Kentucky and the nation have also seen some progress in the remediation of federal Superfund sites. Currently, 89% of the 1,405 federal Superfund sites have cleanups underway. In Kentucky, seven of the 20 Superfund sites have had remediation completed, and these sites are now in the operation and maintenance (O&M) phase.

Figure 18 Expenditures from Kentucky Hazardous Waste Management Fund



As of January 1999, the Hazardous Waste Management Fund contained a balance of $848,309.

*Note: As of Dec. 1998. *Funds appropriated for cleanups. **Remediation complete or ongoing. Source: Ky. Division of Waste Management*

Figure 19 State Priority Waste Sites

Site	County	Status
Tindall Property	Anderson	RI
Johnson Fork Dump	Boyd	RD
Donaldson Art Sign	Boyd	RD
Douglas Lane	Boyle	RI
Mudd Property	Bullitt	RI
Ecology Systems	Calloway	RI
Hunts Hardwoods	Crittenden	RA
Eva Smith Property	Daviess	RD
Aldergate Tire Fire	Estill	RI
Tobacco State	Fayette	RI
Great South. Refinery	Fayette	RI
Jeff Meade Landfill	Greenup	RD
Ky. Industrial Haulers	Hardin	RD
Kwik Klean Cleaners	Hopkins	RD
Exmet	Jefferson	B
Ponderosa Speedway	Lincoln	RI
Allen Chemical	Marion	RA
BC Battery	Nelson	RA
Derby Tank & Car	Meade	RI
Primary Recovery	Muhlenberg	RI
Rad Chemical	Warren	RD

RD-Remedial design (cleanup plan under development). RA-Remedial assessment (site under study). RI-Remedial investigation (site under investigation). B-Contained in place and managed.
Source: Ky. Division of Waste Management

Figure 20 Federal Superfund Sites In Kentucky

Site	Listed	Status
A.L. Taylor-Valley of Drums Brooks–Bullitt Co.	1981	cleanup complete-O&M
B.F. Goodrich/Airco (2 sites) Calvert City–Marshall Co.	1982	cleanup complete-O&M
Distler Brickyard West Point–Hardin Co.	1982	cleanup complete-O&M
Distler Farm Louisville–Jefferson Co.	1982	cleanup complete-O&M
Lee's Lane Landfill Louisville–Jefferson Co.	1982	cleanup complete-O&M
Newport Dump Wilder–Campbell Co.	1982	cleanup complete-O&M
Smith's Farm Brooks–Bullitt Co.	1984	cleanup underway
Maxey Flats Hillsboro–Fleming Co.	1986	cleanup underway
Howe Valley Howe Valley–Hardin Co.	1987	cleanup complete-O&M
Red–Penn Sanitation Co. Peewee Valley–Oldham Co.	1989	no action
Tri–City Indstrl. Disp. Site Brooks–Bullitt Co.	1989	cleanup underway
Brantley Landfill Island–McLean Co.	1990	cleanup underway
Caldwell Lace & Leather Auburn–Logan Co.	1990	no action
Fort Hartford Coal Olaton–Ohio Co.	1990	cleanup underway
General Tire & Rubber Mayfield–Graves Co.	1990	no action
Green River Disposal Site Maceo–Daviess Co.	1990	cleanup underway
Paducah Gaseous Diff. Plant Paducah-McCracken Co.	1992	site study
National Southwire Alum. Hawesville-Hancock Co.	1992	site study
National Elec. Coil Dayhoit-Harlan Co.	1992	cleanup underway

O&M - Remediation complete and in operation and maintenance. Source: Ky. Division of Waste Management

Indicator 13: Underground Storage Tanks

Background Underground petroleum and hazardous chemical storage tanks began to be regulated in Kentucky in 1986. These tanks can leak and pose pollution threats to drinking water supplies and to the environment.

Source There are 44,937 underground storage tanks (USTs) registered in Kentucky. An estimated 14,323 are in active use and 30,614 have been closed. There are also hundreds of thousands of tanks in Kentucky that have not been registered. Many at abandoned gas stations.

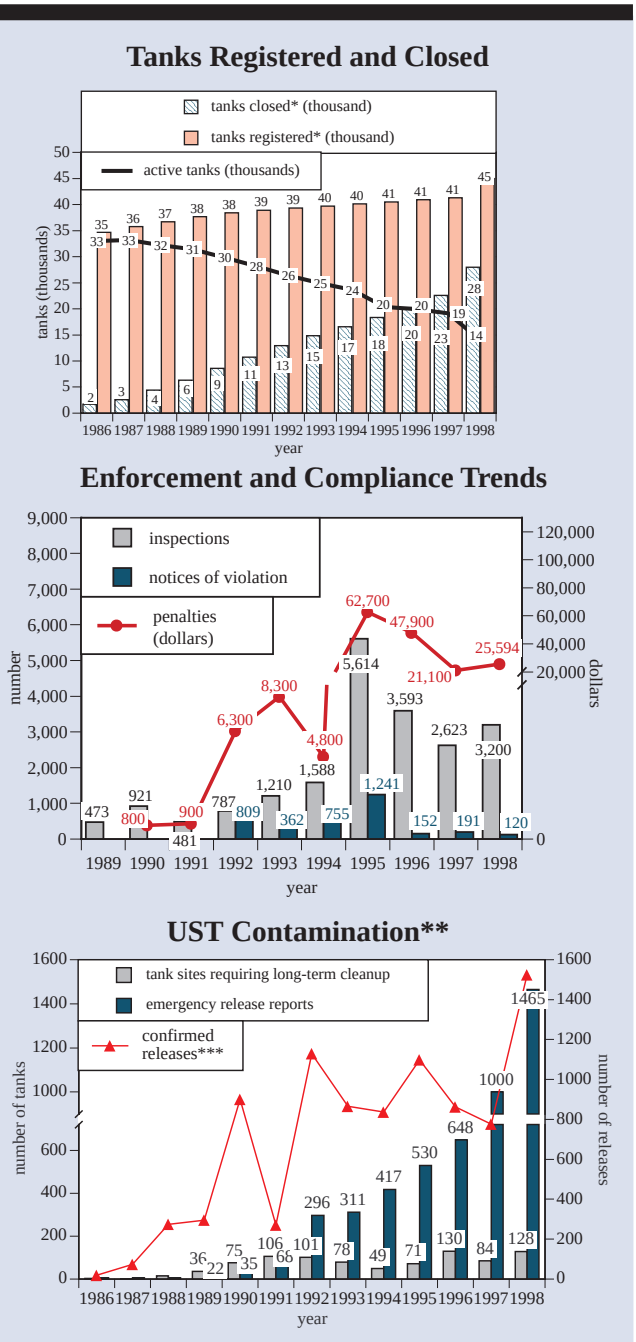
Goal Ensure compliance for all active underground storage tanks for leak detection, spill prevention, overfill prevention, and corrosion protection requirements.

Progress As of February 1999, 95.1% of the 14,323 active registered USTs met 1993 release detection rules, 81.4% met the 1998 overfill requirements and corrosion protection requirements, and 82.6% met spill prevention requirements.

UST systems that did not meet the 1998 deadline, but intend to comply, had the option of notifying the state and being placed in temporary closure. This will give tank owners until December 22, 1999, to upgrade or close their facilities. As of March 25, 1999, 7% of the active tanks in Kentucky (913) did not meet the 1998 tank standards. This is a significant improvement since November 1998, when 45% of the active tanks did not meet the 1998 tank rules.

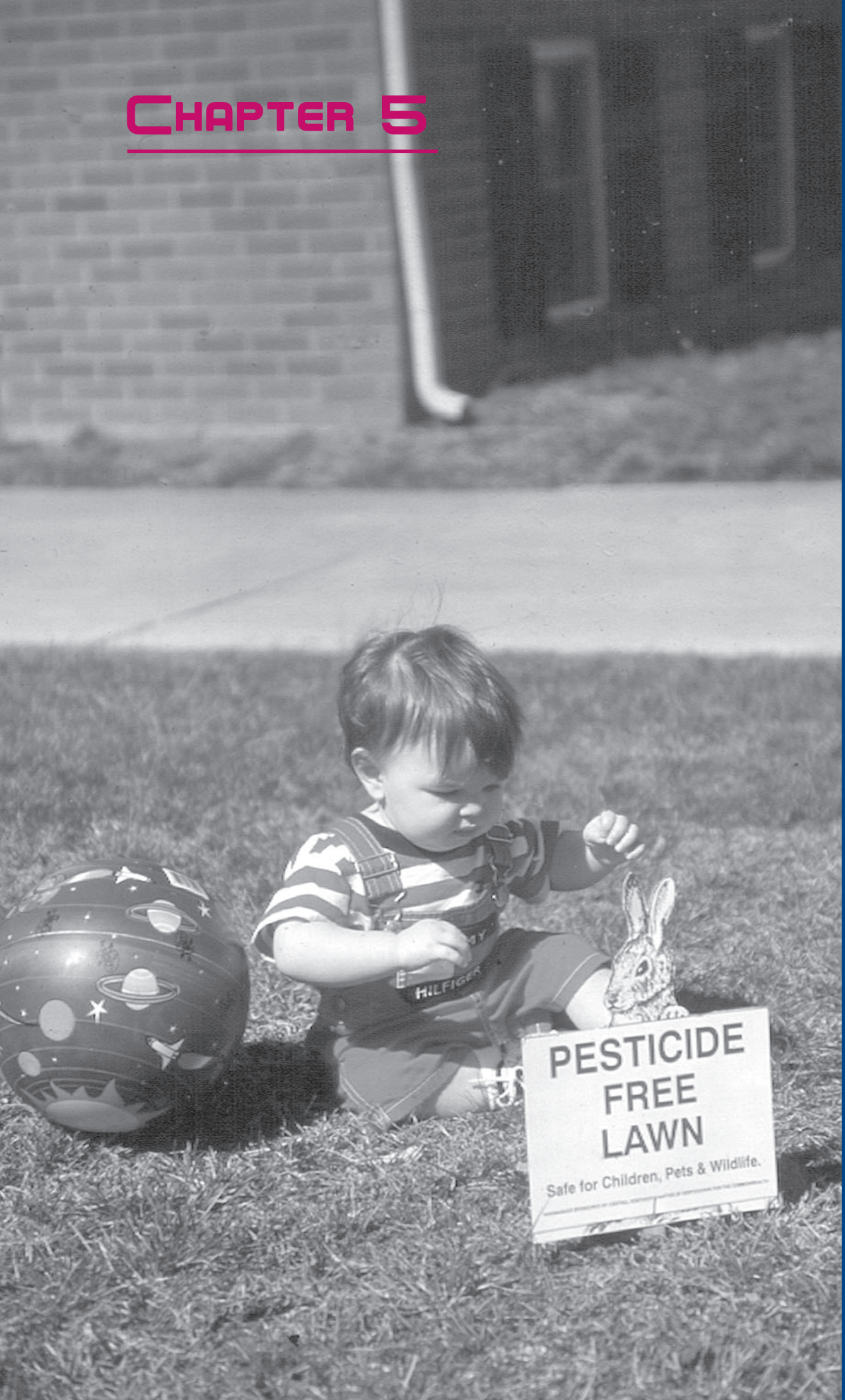
Many UST site cleanups have been financed by the state Petroleum Storage Tank Assurance Fund, established in 1990. The purpose of the fund is to provide insurance to tank owners and help pay for tank cleanups. The law provides for a fee of 1.4 cents per gallon of motor fuel sold in the state to finance the fund. As of October 1998, $179 million has been obligated from the fund to 1,952 applicants, and approximately $45 million remains unobligated. To date, 613 of the funded projects have been remediated at an average cost of $49,600 per site. There are 1,250 UST project fund cleanups currently underway.

Figure 21 Underground Storage Tanks Status in Ky.



*Note: *Cumulative yearly total. **Soil and/or groundwater contamination. Chart uses revised data from the computer system which may differ from previous EQC reports. ***Confirmed releases are defined as either laboratory or field evidence of contamination. Source: Ky. Division of Waste Management.*

Chapter 5



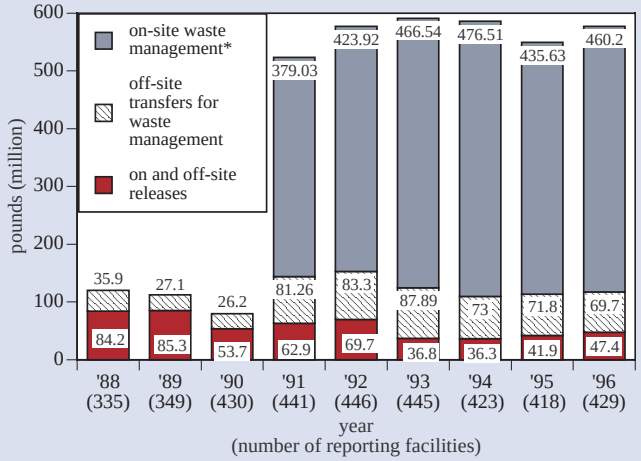
Toxics

Indicator 1: Generation of Toxics

Background Toxic chemical wastes are produced as by-products of the manufacturing process. The primary source of information relating to the generation, release, or transfer of toxic chemicals is the Toxics Release Inventory (TRI). The TRI was created by Congress as part of the federal Emergency Planning and Community Right-to-Know Act of 1986. The act requires certain manufacturers to self-report to the public the amount of more than 650 chemicals generated, released, or transferred for treatment. But TRI has serious limitations when it comes to detailing toxic releases and measuring reduction trends. The U.S. Office of Technology Assessment estimates that the TRI accounts for only 5% of the total releases of toxic chemicals to the environment. And chemicals are continually added to or deleted from the TRI list, making yearly comparisons difficult. Still, TRI is the best data available to monitor toxic generation and releases to the environment.

Figure 1

Generation of TRI Toxic Chemicals in Kentucky



Source: Toxics Release Inventory Reports

*Note: Previous years are not adjusted for newly added or deleted chemicals. Data not required to be reported on recycling and energy recovery until 1991. *On-site waste management category was added in 1991 and includes chemicals generated, treated, and recovered at the site of generation.*

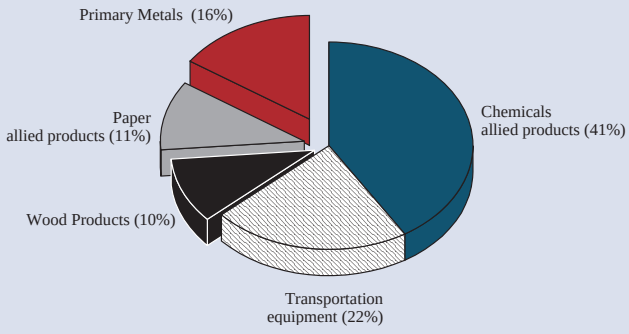
Source In 1996, the most recent year that TRI data are available, 21,626 facilities in the U.S. reported generating 23.4 billion pounds of toxic chemicals and related waste. In Kentucky, 429 facilities generated 577 million pounds of TRI chemicals during 1996.

Goal Reduce the weight of toxic chemicals generated (per KRS 224.46-305) by 25% at each Kentucky facility by January 1, 1997, and a 50% reduction by January 1, 2002, using 1987 as a base year.

Progress In 1996, 429 facilities reported generating 577 million pounds of TRI chemicals. To put this in perspective, that amounts to nearly 148 pounds of toxic chemicals for every man, woman, and child residing in Kentucky. The chemical/allied products industry was the largest generator of TRI toxic chemicals, accounting for 41% of the total generation. No specific analysis has been conducted in the state to determine if each facility generating TRI chemicals has met the 25% and 50% reduction goals.

Figure 2

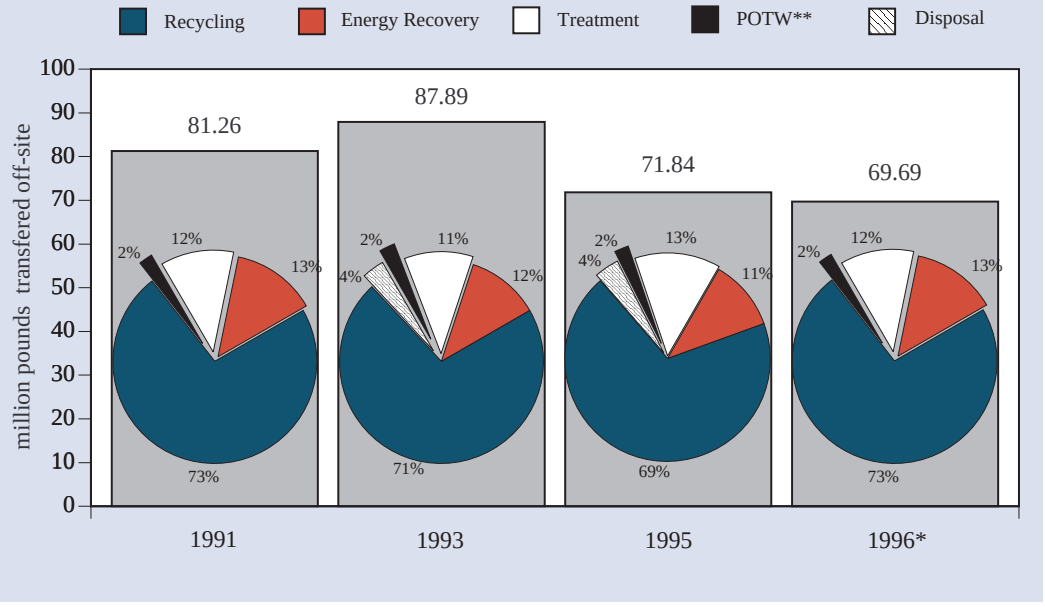
Major Generators of TRI Toxic Chemicals in Kentucky (1996)



Note: Based on generation of 577 million lbs. of toxic chemicals reported by Ky. manufacturers.
Source: Toxics Release Inventory Report

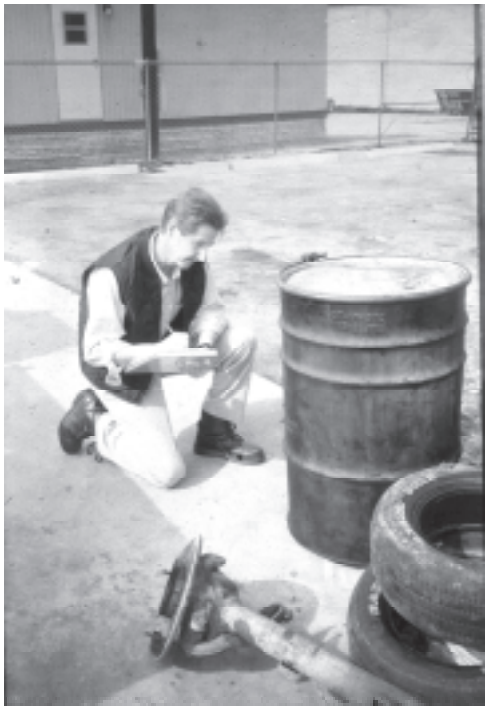
Indicator 2: Toxic Chemical Transfers

Figure 3 **Kentucky Generated TRI Toxic Chemical Waste Transferred Off-Site**



*Note: Transfers off-site for recycling, energy recovery, treatment, disposal, and to POTWs were not tracked until 1991. *U.S. EPA moved transfers off-site for disposal into the release category. 1996 was the first year that land disposal off-site was tracked as a release. **POTW-Publicly Owned Treatment Works.*
Source: Toxics Release Inventory Reports

Background About 80% (460 million tons) of the 577 million pounds of the TRI toxic chemicals produced in Kentucky during 1996 was treated at the site of generation while 8% (47.4 million pounds) was released to the environment. The remaining 12% (69.7 million pounds) was transferred off-site for treatment or disposal. Chemicals can be transferred off-site for recycling, energy recovery, treatment (includes neutralization, incineration, biological and physical separation), to a public wastewater treatment plant for treatment, or to a landfill for disposal.



Source During 1996, 242 facilities in Kentucky reported transferring toxics off-site for treatment. Kentucky ranked 16th in the nation in the amount of chemicals sent off-site. In addition, Kentucky received 1.5 million pounds of TRI waste from other states for treatment.

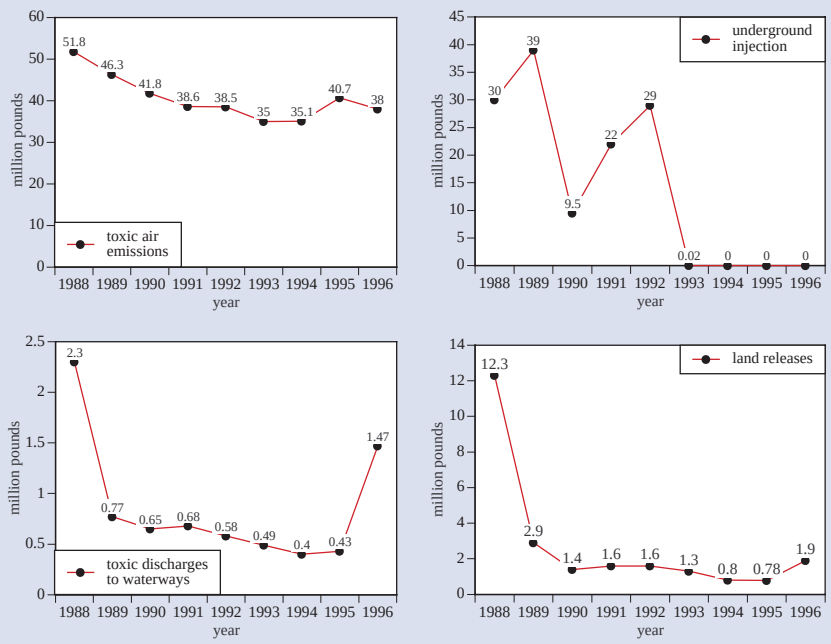
Goal To promote a hierarchy of waste management priorities with source reduction the preferred option as specified in the federal Pollution Prevention Act of 1990. If a waste cannot be eliminated outright, then the second-best waste management option is to recycle, followed by treatment, and lastly disposal.

Progress A majority of the toxic waste transferred off-site by Kentucky facilities, 50.7 million pounds (73%), was recycled in 1996. Another 13% (9.4 million pounds) was recovered for energy and 12% (eight million pounds) was treated to render it non-toxic.

Indicator 3: Toxic Releases to the Environment

Figure 4

TRI Chemical On-Site Releases to Kentucky's Environment



Note: Previous years are not adjusted for newly added or deleted chemicals. Disposal to land does not include pounds of chemicals disposed at landfills off-site. In 1996, 5.98 million pounds of TRI chemicals generated in Kentucky were disposed in landfills off-site in 1996. In 1994, 2.8 million pounds were disposed off-site.
Source: Toxics Release Inventory Report

BACKGROUND Most of the TRI toxic chemical by-products produced in Kentucky are managed at the site of generation, primarily through recycling and treatment. However, 8% (47.4 million pounds) of the 577 million pounds of toxic chemicals generated during 1996 were released to the environment. A release is an on-site or off-site discharge of toxic chemicals to the land, air, or water.

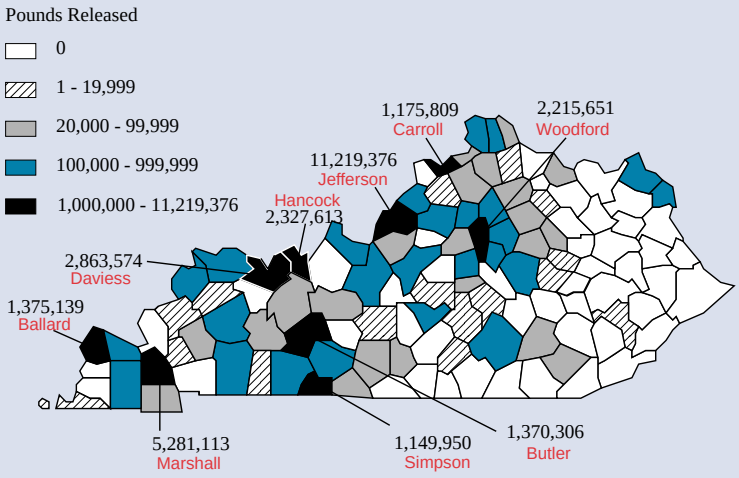
SOURCE In 1996, 337 Kentucky facilities reported releasing toxic chemicals into the environment. Ten companies accounted for 49%, or 23.3 million pounds, of the toxic chemicals released. Nine counties received 73% of the toxic releases that year.

GOAL Reduce the weight of toxic chemicals generated (KRS 224.46-305) by 25% at each Kentucky facility by January 1, 1997 and by 50% by January 1, 2002, using 1987 as a base year.

PROGRESS In 1996, Kentucky industries reported releasing 47.4 million pounds of toxic chemicals to the environ-

Figure 5

TRI Toxic Chemical On-Site Releases to Air, Land, Water in Kentucky (1996)



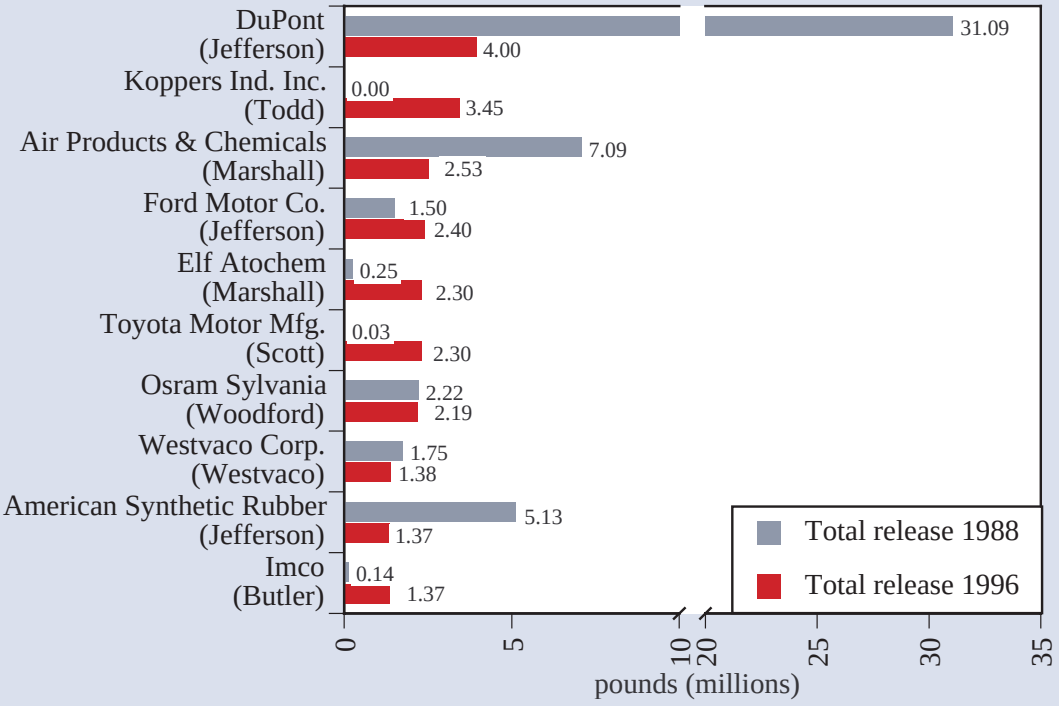
Note: Releases on-site of generation.
Source: Toxics Release Inventory Report

Figure 6 **Top Ten TRI Toxic Chemicals Released to Ky's Water, Land, Air (1996)**

Water Releases (lbs.)	*Land Releases (lbs.)	Air Releases (lbs.)
Nitrate Compounds (1,018,690)	Aluminum (1,218,950)	Methanol (5,005,957
Methanol (193,540)	Copper Compounds (139,769)	Xylene (4,466,941)
Ammonia (102,733)	Manganese (117,079)	Chlorodifluoromethane (4,289,701)
Ethylene Glycol (22,850)	Barium Compounds (112,639)	Toluene (3,935,803)
Formaldehyde (21,902)	Cadmium Compounds (50,700)	N-Hexane (2,591,748)
Chlorine (13,333)	Antimony Compounds (41,868)	Glycol Ethers (1,834,273)
Acetaldehyde (11,999)	Manganese Compounds (36,082)	1-chloro-1,1-difluroethane (1,574,000)
Manganese Compounds (11,157)	Lead Compounds (34,000)	Dichloromethane (1,209,567)
Zinc Compounds (10,526)	Zinc Compounds (30,366)	Hydrochloric Acid (900,962)
Tert-Butyl Alcohol (9,699)	Chromium Compounds (29,301)	N-Butyl Alcohol (863,818)

**Includes only on-site releases to land. Source: Toxics Release Inventory Report*

Figure 7 **Top 10 Kentucky Facilities Releasing TRI Chemicals (1996)**



Note: 1996 numbers include both land releases and transfers off-site for land disposal. Source: Toxics Release Inventory Reports

ment. Kentucky is ranked 20th in the nation in toxic releases. A majority of these releases, 87% (38 million pounds), were to the air.

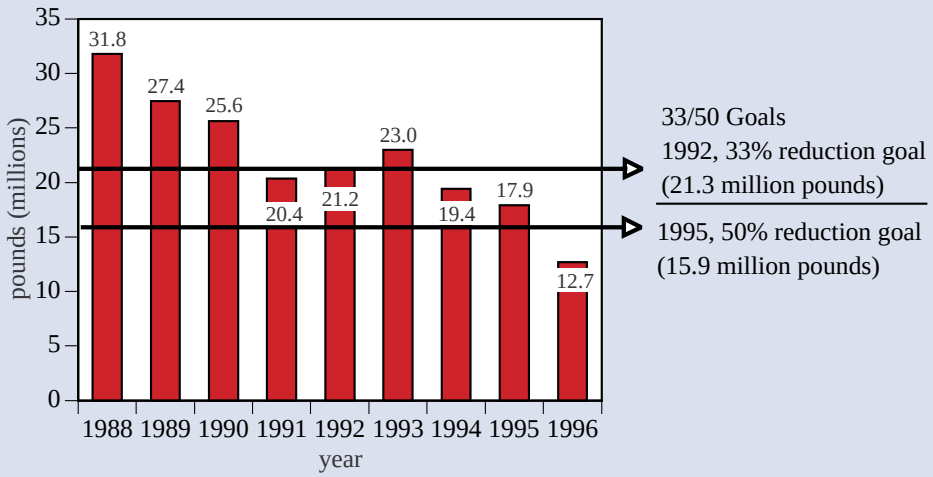
The total releases of toxic chemicals to Kentucky's environment dropped by 51% from 1988 to 1996, primarily in response to DuPont eliminating the underground injection of hydrochloric acid after finding a market for it in 1992. However, between 1995 and 1996, overall toxic chemical releases increased 13%. This was likely due to the addition of 282 new reportable chemicals and an increase in manufacturing related to an improved economy. For example, there was a threefold increase in toxics released to waterways between 1995 and 1996 due to the addition of nitrates to reportable chemical releases. American Steel in Carroll County reported 946,810 pounds of the 1,018,690 pounds of nitrates reported released to waterways in 1996.

While a specific analysis has not been conducted to determine which facilities have reduced toxic emissions, a review of the top ten companies with toxic releases reveals that four have reduced releases since 1988. For example, Air Products and Chemicals in Marshall County cut releases by 64% while American Synthetic Rubber Corp. in Jefferson County reduced toxic emissions 73% between 1988 and 1996.

Indicator 4: Priority Toxics

Figure 8

Generation of 17 TRI Priority Toxics in Kentucky



Note: Based on releases on-site and transfers off-site for waste management. Does not include transfers for recycling and energy recovery which were not reported until 1991. Yearly totals are based on the reduction of priority chemicals by all Ky. facilities and not just those participating in the national 33/50 program. Source: Toxics Release Inventory Reports

Background In 1991, the U.S. EPA launched a national program to encourage industries that release significant amounts of highly toxic chemicals to voluntarily reduce their emissions. The national "33/50 Program" is designed to track the release and transfer of 17 TRI priority chemicals. These chemicals were targeted by U.S. EPA for reduction because they are highly toxic, used in large volumes, or pose a significant risk to public health and the environment.

Source Nationwide, 1,300 companies participate in the U.S. EPA's 33/50 Program. Approximately 76 of the companies have facilities in Kentucky.

Goal Reduce the generation of 17 TRI priority chemicals 33% by 1992 and 50% by 1995, using 1988 as the base year.

Progress The U.S. EPA reports that participating companies have met the 33/50 program reduction goals. Total U.S. generation of 17 TRI priority chemicals was reduced by 55.6% between 1988 and 1995. Kentucky met the 33% 1992 reduction goal, but failed to meet the 50% reduction goal in 1995. Kentucky did meet the 50% reduction goal in 1996. Between 1988 and 1996, 24 companies in the state reduced the generation of priority toxics by 50%.

A review of generators of 17 TRI priority chemicals in Kentucky reveals that ten companies accounted for 78% of the priority toxics produced in 1996. Two companies, Ford Motor Co. and Sherwin Williams, led the state in 1996 production of priority toxics and accounted for 41% of the statewide total generation.

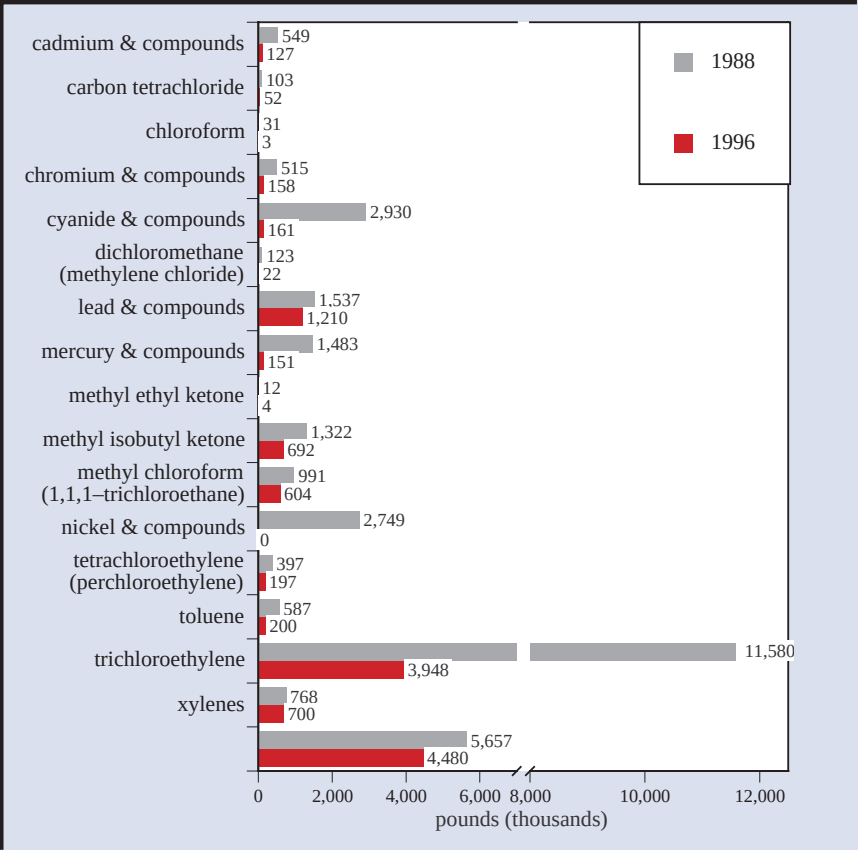
Figure 9

Top Ten Kentucky Generators of 17 TRI Priority Toxics (1996)

Facility	County	Generation (lbs.)
Ford Motor Co.	Jefferson	2,802,486
Sherwin Williams	Madison	2,380,462
American Synthetic	Jefferson	1,382,770
Akzo Coatings	Jefferson	1,067,390
ISP	Marshall	864,101
Johnson Controls	Jefferson	429,663
United Catalysts	Jefferson	320,646
Ashland Petroleum	Boyd	281,175
Rayloc	Union	214,133
Englehard	Jefferson	191,165
total top 10		**9,933,991**
total state		**12,677,482**

Note: Based on releases on-site and transfers off-site for waste management of 17 priority toxics. Does not include transfers for recycling and energy recovery. Source: Right To Know Network, Toxics Release Inventory Report

Figure 10 Release and Transfer of 17 TRI Priority Toxics in Kentucky



Note: 33/50 or priority toxics are 17 chemicals prioritized for reduction by the U.S. EPA due to their high toxicity, carcinogenicity, or high volume of release with potential environmental impacts. This chart includes releases on-site and transfers off-site. Excludes transfers for recycling and energy recovery which were not required to be reported until 1991.
Source: Toxics Release Inventory Reports

Figure 11 Kentucky Companies Reducing 17 TRI Priority Toxics by 50% (1988-1996)

County	Company	County	Company
Boyle	ATR Wire & Cable	Hardin	Gates Rubber
Boyle	Phillips	Hancock	Willamette
Bullitt	Interlake Conveyor	Jefferson	Am. Syn. Rubber
Boone	Emerson Electric	Jefferson	B.F. Goodrich
Ballard	Westvaco	Jefferson	Borden
Carroll/Hardin	Dow Corning	Jefferson/Green	E.I. DuPont
Christian	Ebonite	Marshall	Air Products
Daviess	Green River Steel	Marshall	North Star Steel
Fayette	Trane	Marshall	SKW Alloys
Greenup	North Am. Refractories	McCracken	U.S. Enrichment
Hardin	Collis	Pulaski	Tecumseh Products
Hardin	Copper Industries	Warren	Lord

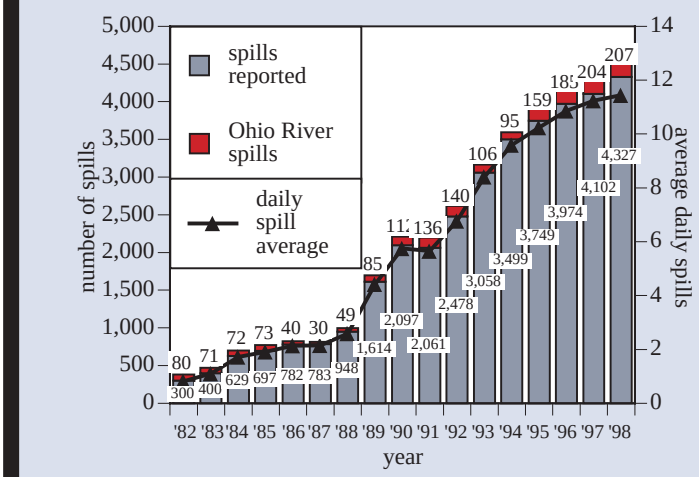
Note: Based on releases on-site and transfers off-site for waste management for 17 TRI priority toxic chemicals.
Source: Right To Know Network, Toxics Release Inventory Report

Indicator 5: Toxic and Hazardous Spills

Background Each year millions of gallons of toxic and hazardous substances are accidentally spilled along transportation routes and at industrial sites in the U.S. Industries and others handling these materials are required to report spills and accidental releases to the state and other agencies.

Source There are numerous sources of toxic and hazardous material spills in Kentucky including truck, train, and barge accidents and industrial spills and releases.

Figure 12 Toxic and Hazardous Spills in Kentucky

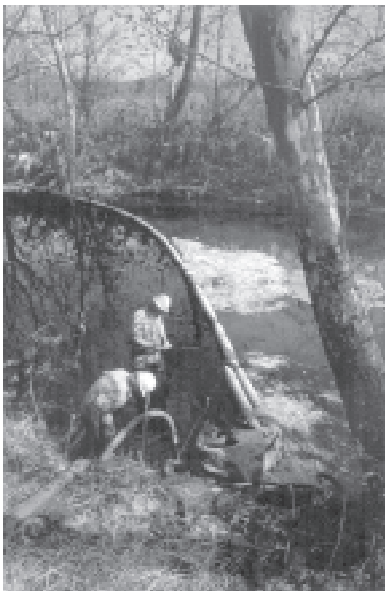


Note: 1982-83 data are estimates. 1986 Federal Emergency Planning and Community Right-Know Act law requires more extensive spill reporting.
Source: Ky. Dept. for Environmental Protection; Ohio River Valley Water Sanitation Commission

Goal Prevent and respond to and contain spills to minimize environmental degradation and public health threats.

Progress Spill incident notifications received by the Kentucky Department for Environment Protection's Environmental Response Team have increased from one report a day in 1983 to 11 a day in 1998. The 17-year rise in reported spills is attributed to an increase in transportation activity (stronger economy), tightening of reporting requirements earlier in the decade, and better education and awareness of reporting requirements. In 1997, there were 4,327 release incidents reported, 34% of which were in response to leaking underground storage tanks.

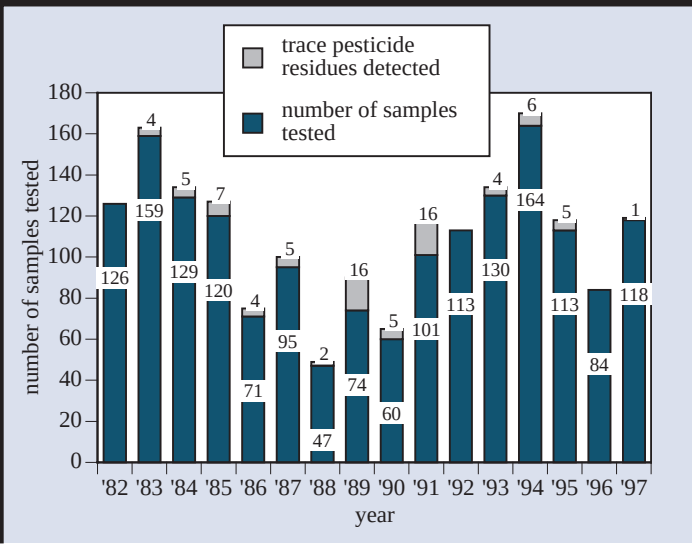
Two large incidents have occurred in Kentucky in recent years. A fire, of unknown origin, at the Cargill fertilizer plant in Maysville occurred on January 4, 1998, and burned a 75,000-square-foot building containing 400 tons of ammonium nitrate fertilizer. The release of toxic chemicals into the air forced the evacuation of nearly 3,000 residents and a consumer drinking water advisory was issued for one day. Another major spill occurred at the Ashland Oil Refinery in Catlettsburg on December 21, 1997. Negligence of the tankerman and mechanical failure while filling an oil barge resulted in a spill of 46,500 gallons of heavy oil into the Big Sandy River. One drinking water intake was temporarily closed as a precaution.



Indicator 6: Pesticides in Food

Figure 13

Pesticide Residues in Kentucky Produce



Note: Food samples screened for parts per billion of chlorinated pesticides and .05 parts per billion of organophosphates. If other contaminants are suspected, additional testing is conducted. Residue levels detected have been below tolerance standards since 1990.

Source: Ky. Department for Public Health

Background Ensuring the safety of the nation's food supply remains a high priority among federal and state officials. The Centers for Disease Control and Prevention report 8,557 confirmed cases of food poisoning in the U.S. in 1997. However, it is estimated that up to eight million food poisoning cases may have gone unreported that year. While the majority of these incidents involved bacteriological contamination of food, chemical contamination, in the form of pesticides, poses threats as well. Because public concern was so great, Congress passed the Food Quality Protection Act in 1996. This act amends the two previous pesticide-related statutes—the Federal Insecticide, Fungicide, and Rodenticide Act (FIFRA) and the Federal Food, Drug, and Cosmetic Act, which contained the Delaney Clause. The Food Quality Protection Act requires the government, for the first time, to consider the risks associated with cumulative exposure to all pesticides in food. This act also requires additional protections for infants and children.

Source In the U.S., 2.2 billion pounds of pesticides are used each year on food crops. There are currently 20,000 registered pesticide formulations. Of these 20,000 pesticide formulations, the U.S. EPA has set residue (tolerance) limits on 9,000. The U.S. EPA plans to reassess tolerance limits and exemptions for 500 pesticide active ingredients by the year 2007 to meet the new requirements of the Food Quality Protection Act.

Goal Reduce the health risks of pesticide residues in food.

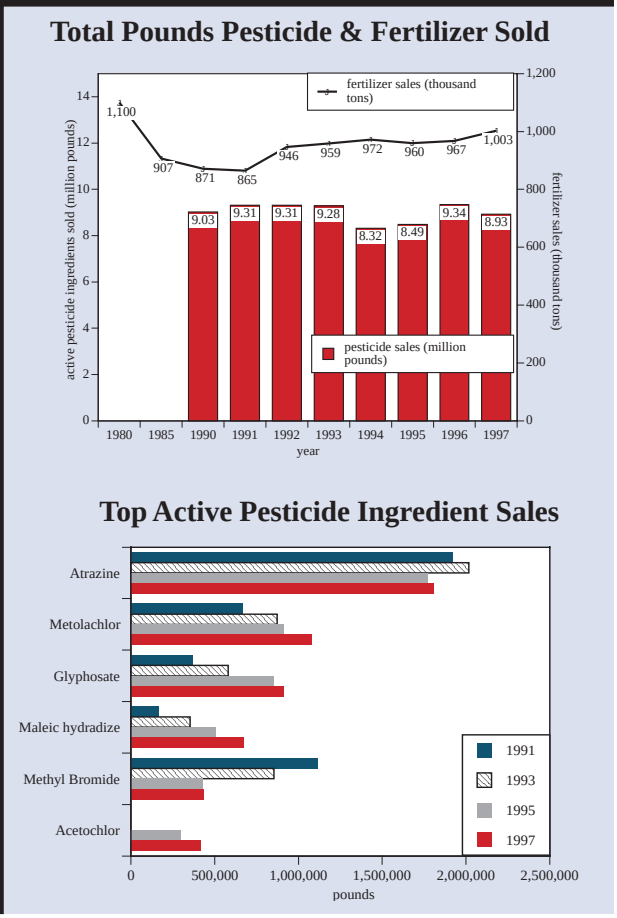
Progress The U.S. Food and Drug Administration reports that 34% of the food they tested during 1997 had detectable pesticide residues of which 1.4% of samples were above the safe limits. The Kentucky Cabinet for Health Services randomly samples produce grown in the state for pesticide residues. In 1997, 118 samples were tested. One trace residue was detected in a sample which was below the tolerance level.

Public and commercial interest in foods produced without the use of chemicals is growing. As of March 1998, 67 organic farms (8,666 acres) were certified by the state. About 929 acres are currently in active organic crop production in Kentucky.

Indicator 7: Agricultural Chemicals

Background Agricultural chemicals are widely used in Kentucky to enhance crop production. However, there is increasing concern regarding the health and environmental effects associated with the use of more than 20,000 different pesticide products. For example, agricultural chemicals have been detected in private well water, in several communities' raw drinking water supplies, and periodically in finished public drinking water supplies. A pesticide, for purposes of this report and as defined under federal law, is a broad nonspecific term that includes insecticides, herbicides, fungicides, and other agents.

Figure 14 Agricultural Chemical Sales in Kentucky



Note: Pesticide sales based on annual surveys. Pesticide sales data not available prior to 1990.
Source: Ky. Department of Agriculture, Ky. Agriculture Statistics Service

Source Agriculture accounts for 75% of the total amount of pesticides used in the U.S. There are 13.9 million acres of farmland in Kentucky, covering 55% of the state's land area. Kentucky farmers used an estimated 9.34 million pounds of pesticides in 1996—the highest amount sold since the state began tracking sales in 1990. The total pounds of pesticides sold in Kentucky increased 10% between 1995 and 1996. This increase is likely due to a 21% larger corn crop in 1996 from 1995 levels. Soybean production increased 8% over 1995 levels, winter wheat was up 15% (the second largest crop on record), and harvested acres of tobacco were up 30,000 acres in 1996—the largest in three years. Pesticide use has since declined 4% between 1996 and 1997.

The top six pesticides accounted for 59% of the sales in Kentucky during 1997. Atrazine remains the top agricultural pesticide sold in Kentucky accounting for 20% of sales. Atrazine is a herbicide used to control weeds in corn fields. Metolachlor, another broad-spectrum herbicide, remains second in sales.

Goal Reduce pesticide use and ensure the safe use and disposal of pesticides.

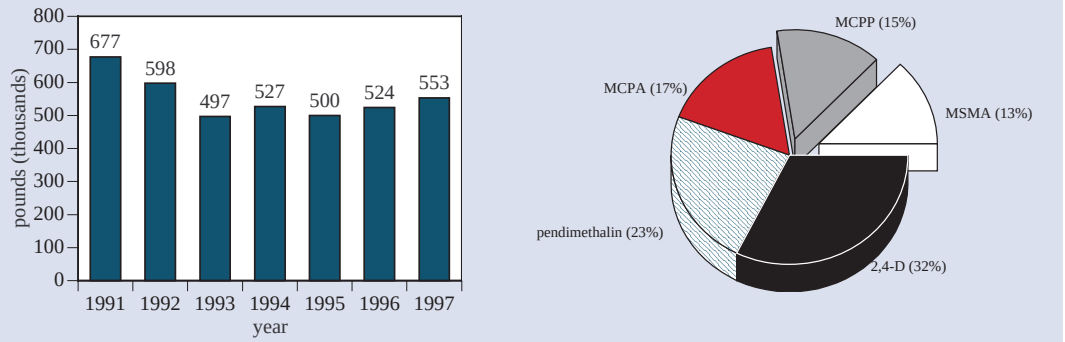
Progress State efforts to promote the safe use and disposal of pesticides continue. The state Division of Conservation encourages the use of Integrated Pest Management (IPM)—a program to reduce pesticide use on farmlands. It is not known how many of the state's 3.7 million acres of cropped land utilize IPM.

The Kentucky Department of Agriculture initiated a program to collect old or unwanted agricultural pesticides related to farm use in 1995. A total of 142,460 pounds of pesticides have been collected from 365 participants and disposed of at the LWD incinerator in Calvert City.

The Kentucky Division of Pesticides also operates a rinse-and-return program for pesticide containers. In fiscal year 1997-98, a total of 89,198 pounds of containers were collected and chipped. That year, 98 counties participated in the program and 466,330 one-gallon and 303,695 2.5-gallon containers were collected and chipped for recycling—a 23.4% statewide recycling rate for pesticide containers, according to the Kentucky Division of Pesticides.

Indicator 8: Lawn-Care Chemicals

Figure 15 Commercial Lawn-Care Chemicals Sold in Kentucky



** Based on 553,000 pounds of active ingredients sold in Ky. to licensed commercial applicators in 1997 as reported in surveys.*
Source: Ky. Division of Pesticides

Background The intense and concentrated use of lawn care chemicals, particularly in densely populated areas, has raised concerns about the potential of these chemicals to contaminate waterways and impact public health. Incidents of contaminated runoff from improper use or disposal of lawn-care chemicals continue to cause water quality problems across the state.

Source It is estimated that 70 million pounds of active pesticide ingredients are applied to lawns each year in the U.S. In Kentucky, an average of 512,000 pounds of chemicals were applied per year to lawns by commercial applicators during the past four years, based on sales survey data.

Figure 16 Certified Pesticide Applicators and Enforcement Actions (fiscal year)

Certification of Applicators

Type	1985	1991	1997
Commercial	3,000	10,000	8,843
Private	20,000	60,000	50,347
Total	**23,000**	**70,000**	**59,190**

Inspections/Enforcement Actions*

	1989	1991	1997
Inspections	5,210	11,000	6,742
Enf. Actions	1,500	1,218	833

**Inspection and enforcement actions by the Ky. Div. of Pesticides.*
Source: Ky. Dept. of Agriculture

Goal Ensure the safe use of pesticides.

Progress The Kentucky Division of Pesticides within the Department of Agriculture enforces laws and regulations governing the safe application and use of lawn-care and agricultural pesticides. The Division certifies and licenses private and commercial applicators of pesticides, requiring applicants to pass a test on proper handling and application techniques. Currently 59,190 applicators are licensed in Kentucky. A majority of the 10,000 commercial licensed applicators are employed by lawn care companies.

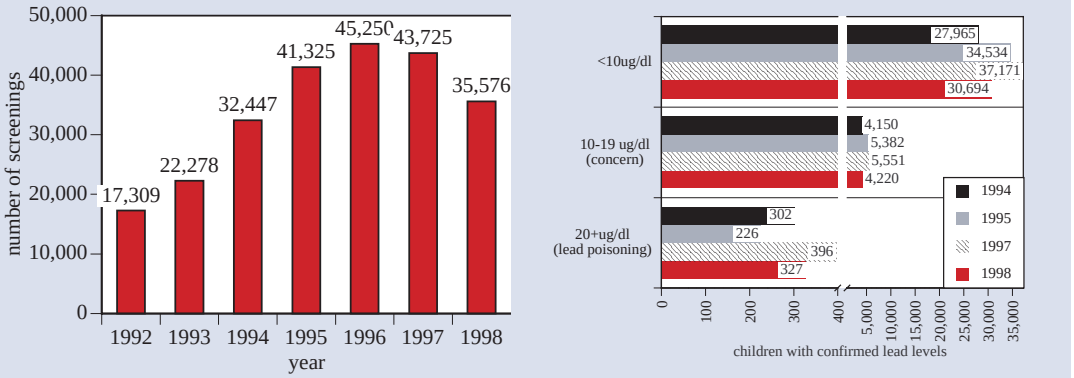
During fiscal year 1997, the Kentucky Division of Pesticides conducted 6,742 inspections and took 833 enforcement actions. A breakdown of enforcement actions is as follows:

Civil complaints issued	1	Administrative hearing	1
Warnings issued	100	Stop-sale, seizure	153
Other	2	Cases assessed fines	12
Compliance assistance	564		

Indicator 9: Blood Lead Levels in Children

Figure 17

Blood Lead Testing in Kentucky Children

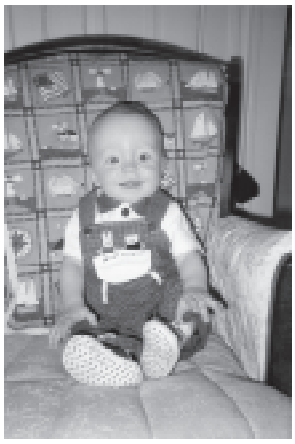


Note: Percentages rounded. µg/dl-micrograms per deciliter of blood. New data collection system started in 1996.
Source: Ky. Department for Public Health

BACKGROUND Lead poisoning is considered to be one of today's most preventable child health problems. About one in eleven children in American has high levels of lead in his/her blood, according to the Centers for Disease Control and Prevention. The long-term effects of lead in a child can be severe. They include learning disabilities, decreased growth, hyperactivity, impaired hearing, and even brain damage. If caught early, these effects can be limited by reducing exposure to lead or by medical treatment.

SOURCE The use of lead in consumer products has dramatically declined since the 1970s and 80s. Leaded gasoline was phased out beginning in 1985 and after December 31, 1995 was no longer available in the U.S. Lead-based paint was banned for domestic use in 1978. But the historic deposition of lead in soils likely from automobile exhaust, lead paint, and industrial air releases remains a problem, particularly in urban areas. Lead-based paint in older homes has become a primary source of lead exposure to children. The U.S. Department of Housing and Urban Development estimates that 64 million dwellings, 75% of the homes built before 1978, have lead-based paint. This translates to 875,000 homes in Kentucky that could contain lead-based paint, 148,750 of which are estimated to have children under six years of age—the age group most susceptible to lead poisoning.

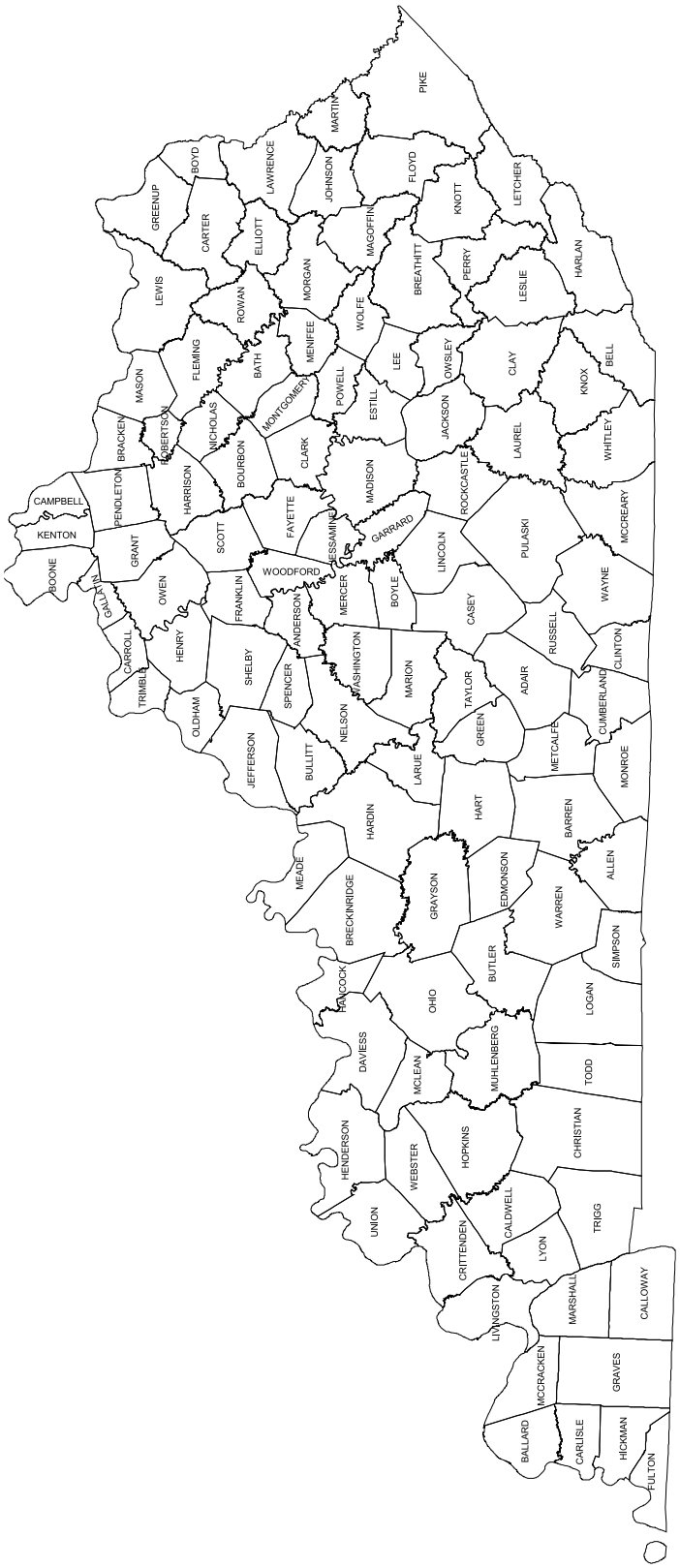
GOAL In 1991, the U.S. Public Health Service established the goal of eliminating childhood lead poisoning by 2011. In conjunction with this goal, the Centers for Disease Control and Prevention (CDC) issued guidelines calling for children age one through five to be screened for lead toxicity. In November 1997, the CDC determined that there was a declining trend of average blood lead levels in children and revised its guidelines to better target children at risk. The Kentucky Cabinet for Health Services is currently reviewing the CDC's new guidelines for screening young children for lead poisoning.



PROGRESS The Kentucky Cabinet for Health Services conducts programs for lead poisoning prevention, child blood-lead level testing, and public education about the hazards of lead. In 1998, local health departments conducted 35,576 blood lead screenings of children under the age of six. The tests found that 327 children (0.9% of those tested) had blood lead levels of 20 µg/dl or above, high enough to cause severe and adverse health impacts. And 12% of the children tested (4,220) had blood lead levels of concern (10 to 19 µg/dl) which could result in behavioral and developmental problems.

Appendices

Appendix A
County Reference Map



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Appendix C
Photo Credits

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